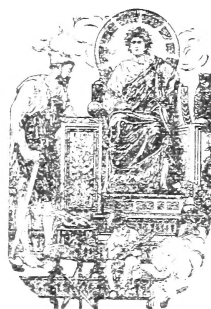


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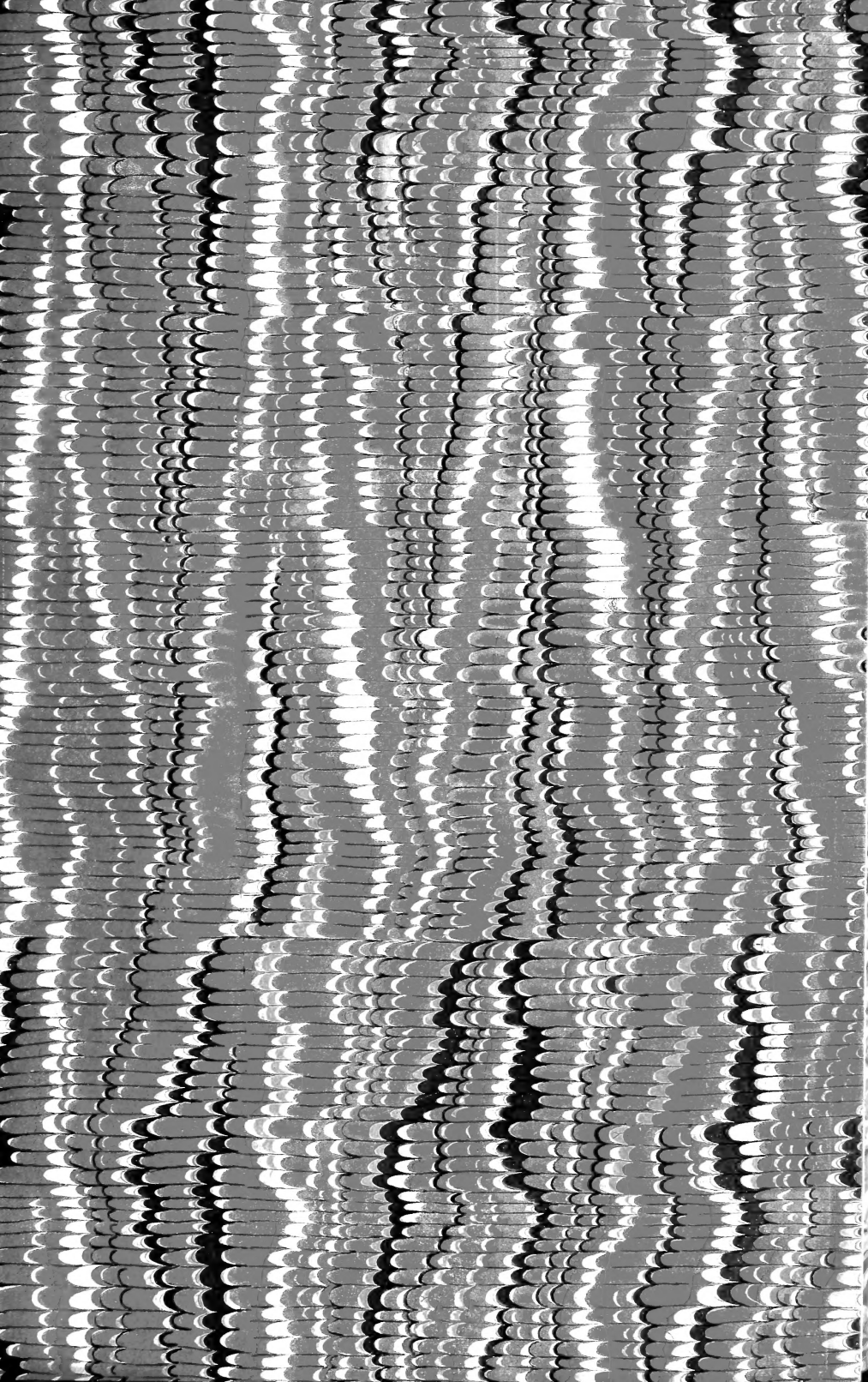
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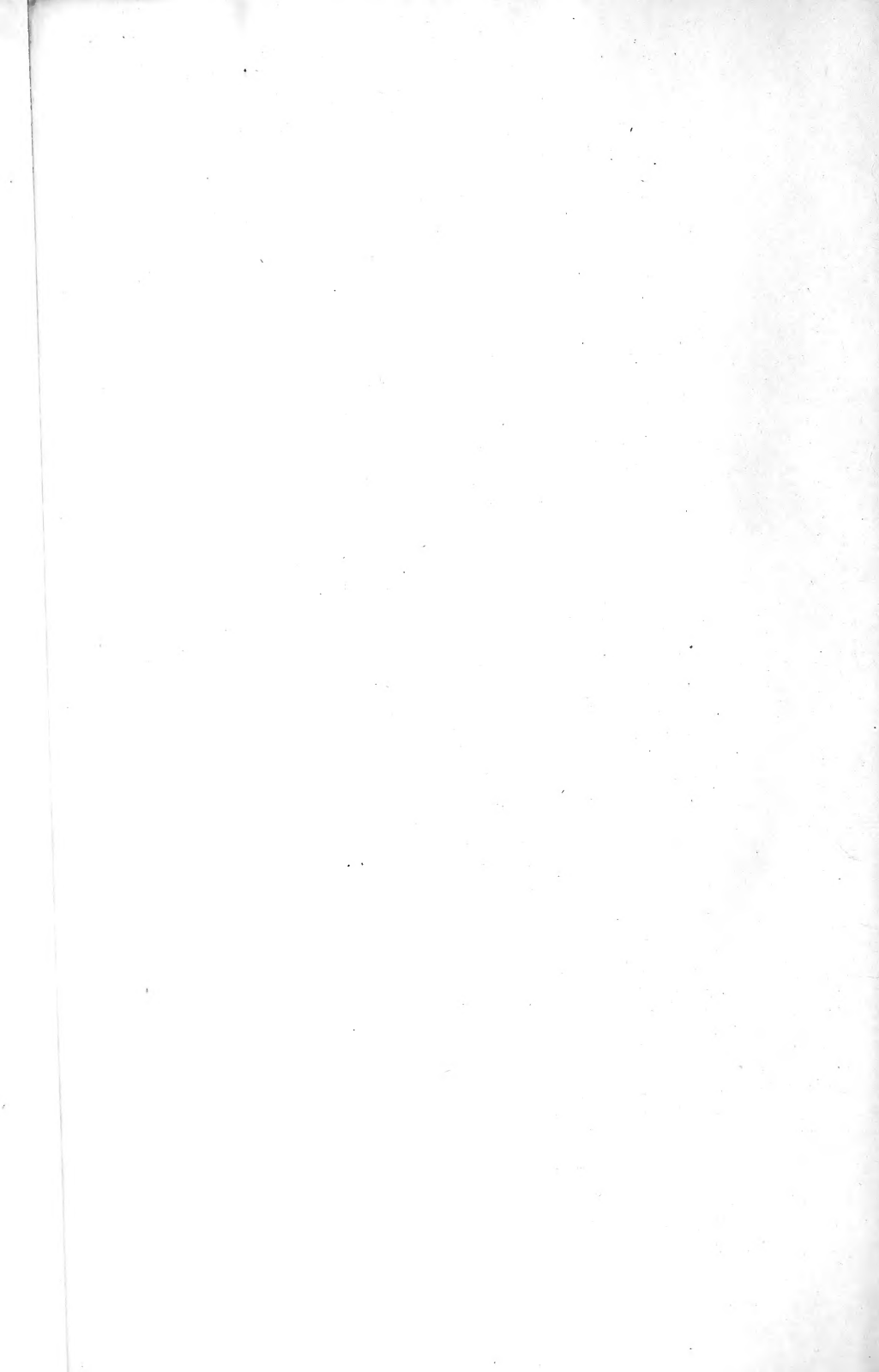
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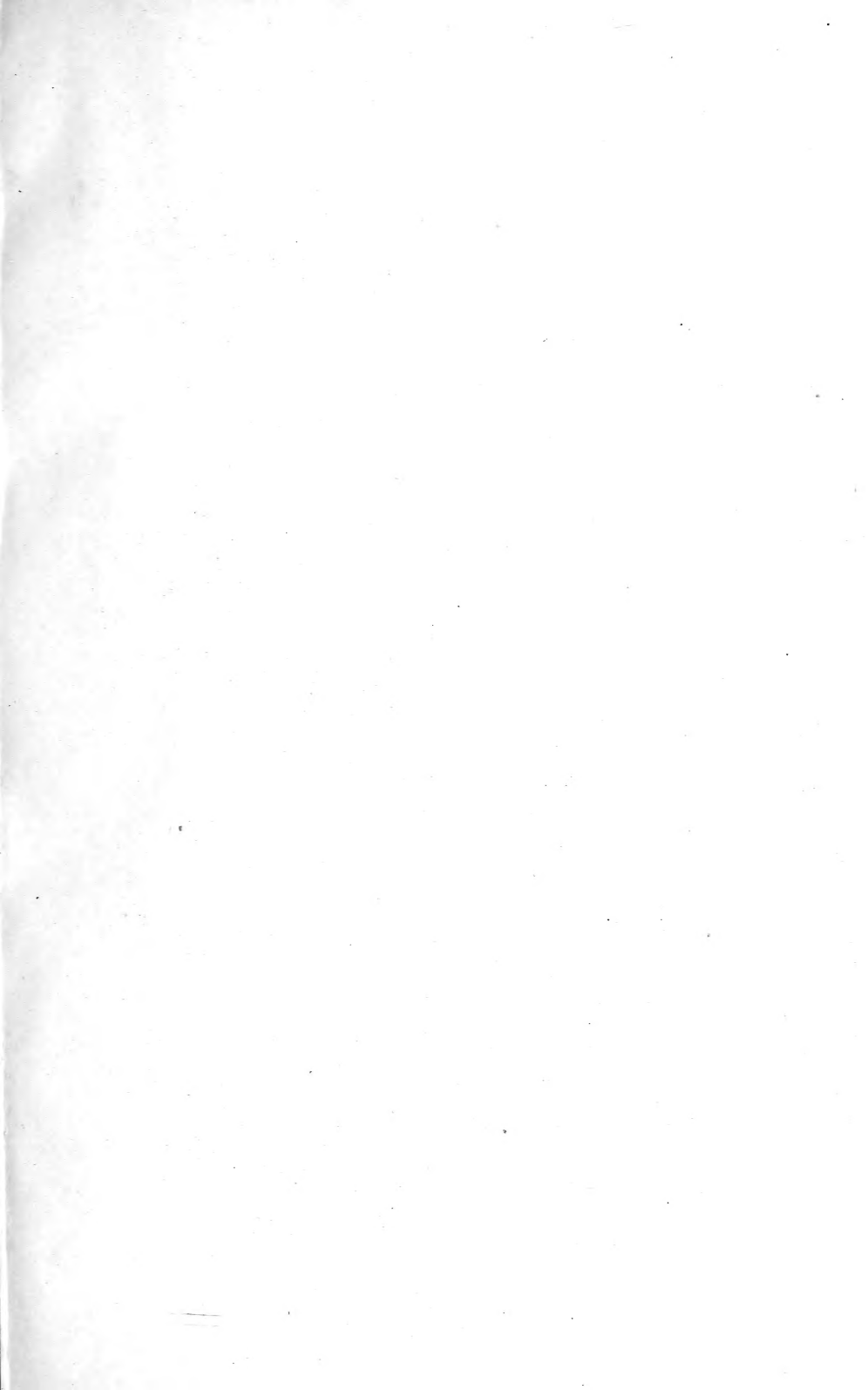
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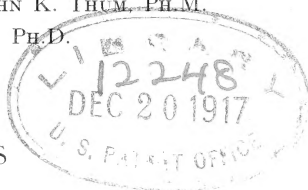
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A LETTER FROM THE ORIENT.¹

MASTIC AND ITS ORIENTAL USES.

BY JOHN URI LLOYD, PHARM.

A series of studies such as I am making is increasingly interesting and instructive. After having obtained second-hand information all one's life concerning Oriental drugs and products, it is refreshing to study them in their homes, and to become acquainted with the methods of collecting, sorting, and preparing. Indeed, I cannot but feel that I have done myself an educational injustice not to have more than once made the effort to learn what a person concerned in drugs should know at first hand, by personal investigation. I am quite of the opinion that, for more reasons than one, it would have been the proper thing had I made such excursions as this long ago, and contributed the results to others. But enough. My object is not to intrude professional study in a letter, however interesting it may be to me.

The methods of life of the Orientals are very instructive. The foods are often somewhat peculiar, as also are the creatures eaten. Nor do we have to go to the land of the Turks for examples. For instance, whoever visits Naples makes a mistake if he misses the *Aquarium*. It is the most complete in the world. Indeed, the world of science contributes to its support. Our Smithsonian Institution makes to it an annual donation of money. Here are to be seen the sea creatures of the Mediterranean Sea, alive, and content. In great glass compartments are the many swimming and creeping things that

¹ Written in Naples, March 26, 1906. The article on Mastic was written in Smyrna, some months later. The right is reserved to its use by a medical and pharmaceutical journal. *J. U. L.*

live beneath the surface of the ocean. Separated are they from each other, because most of them agree about as do the lion and the lamb. Here we see a tank in which we behold a number of creatures that somewhat resemble a great brown shoe, with two glaring eyes in the heel. From beneath come eight arms that everlastingly stretch and again contract, much like India rubber pipes. They project themselves now here, now there; they grasp whatever they touch; they seize a bit of food and next, the arm contracts. Into the stomach beneath the eyes of the creature the helpless victim is irresistibly drawn. But while this is occurring the other arms are stretching in and out, are slipping up and down, are searching near and far, for anything possible. The creature moves as though it, too, were a prey of those rubber arms, which stick by rows of suckers to whatever they touch, and which, in full-grown specimens, have the power of grasping a man and drawing him down to the ocean's depths as easily as these do an unfortunate fish. This is the *octopus*, and the Mediterranean Sea is prolific in them.

Next we turn to a tank in which at first glance we see only rough stones and sand. But, on closer examination we perceive that some of the rough stones are *alive*. They are fish that have the power of imitating the objects among which they rest, both as to color and form. This one is reddish, that one is brown, or black, or yellow, in accordance with the objects among which it lies. Hideous creatures are they, lying there silently awaiting a fish that fails to perceive that stones such as they have mouths. Let us add this fact to the familiar motto, "Stones have ears."

Now the sand *moves*, a darting creature rises from it, and then slowly settles down—to become again *sand*. It is a great flat fish that, now we have located it, is seen to lie so close to the sand and to so nearly resemble it, as to make it impossible to tell where sand ends and fish begins. There are others invisible—we see their still eyes looking upward, but no one can trace their bodies.

The next tank contains crabs with legs, "feet" in length. There are tanks of coral, of miniature sharks, of transparent squids, and hosts of fish and other creatures of all colors, shapes, sizes and habits. The water is as clear as air, the creatures live before our eyes, the most instructive object-lesson of the world concerning aquatic life of this most interesting, semi-tropical sea.

Go now to the market place in Naples. There we find the same hideous creatures—sold as food. Here are baskets of the *octopus*.

the same rubber-like arms, the same glaring eyes. This basket may contain a number of small ones, that basket a few arms chopped off a very large body. Here are the repulsive fish that resemble stones, there the transparent squids, next the cuttle fish, not less unsightly. In fact, whatever the sea breeds seems here to become food for man, or, in its native home, to use man as a food. It is a question, I take it, simply as to which is the stronger—sometimes the man eats the octopus, again the octopus eats the man.

Whoever travels as I am now traveling needs leave his squeamish stomach at home. Ask no questions. Eat whatever others eat. That is good philosophy, and it is good breeding, too. Withal, it is but a difference in education—the man who, in America, eats the slimy oyster or the slippery clam need not criticize him who in this land considers the octopus a delicacy. Nor yet should the man who, amid home surroundings, eats lobster, be sensitive or impatient if here his host serve him a not less repulsive, but more ungainly horned creature instead.

I will close by saying that I have left my family in Smyrna, a city under the dominion of the Sultan of Turkey. I am on my way down the Red Sea to the port of Aden, just around the lower point of Arabia. There I expect to have exceptional opportunities in the way of exact information concerning some subjects that I wish to investigate. Thence I shall return to Turkey and spend as much time as possible among the Oriental products of that country. It is a land of historical charm, and of intense richness in many directions that concern medicine. Both the people and the officials of the various governments spare no effort to give me the opportunity to do well my work. I am taking a great number of photographs in the way of drug studies, as well as life conditions. These I hope to classify on my return, and by such illustrations make effective and instructive lessons on special subjects.

MASTICHE (MASTIC).

History.—The island of Scio, or Chio, lies in the Mediterranean Sea about six hours by steamer from Smyrna. It has long been celebrated in that a pocket of the northern part furnishes the world's supply of mastic. This, too, notwithstanding the fertility of adjacent islands, and their situation as concerns exposure and climate.²

² The circumscribed area of sections producing certain drugs, fruits and natural products, is noticeable enough to warrant a special paper on the subject of such limitations in the Orient.

That the tree will thrive elsewhere is exemplified by the fact that a photograph taken by me of a mastic tree in the garden of Mr. Alfred A. Keun, near Smyrna, is dripping (May 6th) with the transparent, brilliant tears. In the island of Chio, one district is called *Mastikohoria*, which means "Village producing gum mastic," and this district supplies the world with its mastic.

Mastic, like other Oriental gums, resins, and balsams, has been known from antiquity, Theophrastus (4th century before Christ), Dioscorides and Pliny recording it as a product of Chio. It was formerly of great importance, as is indicated by the following record.³

In the Middle Ages the mastic of Scios was a monopoly of the Greek Emperors. The successor of Andronicus II (1304) gave the mastic concession to a rich Genoese named Benedetto Zaccarias, whose family proceeded to rebel against the Emperor, becoming sovereigns of Scio. Subdued by Andronicus III, the island was retaken (1346) by the Genoese, a company called the Giustianiani being formed to do "mastic" and other business. It was very rich, and compared with the famous East India Company, having its own mint, constitution and government, even engaging in wars with the Turks. Severe was their law concerning *mastic*, cruel their punishment of intruders or offenders. In 1566 the Turks captured the island, which since that date has been under Moslem rule. The tribute they levied on the inhabitants was that the ladies of the Sultan's harem should be supplied, free of all expense, with all needed supplies of the choicest of mastic. This little island of Chios, on account of its mastic, has been a center of Oriental interest from the earliest days. It is still famed for its resin, but has lost its former prestige, owing to the waning importance of mastic.

Description.—The mastic tree or shrub grows to the size of a small, scraggly, crab tree, being more bush-like. Much does it resemble the crataegus tree of America. Its bark and small limbs carry numerous ducts that are prone to part with their resinous secretion. This, as it exudes, is brilliant, colorless, water-white, about the consistence of glycerin or honey, and exudes from abrasions, or even forces itself through the natural bark, dripping therefrom in tears. I observed limbs without any visible abrasions and yet, glistening with tears. The slightest abrasion is followed by an abundant flow of gum, and this fact leads to the method of collection.

About June, the ground below the trees is cleansed of trash, and

³ See Pharmacographia by Flückiger and Hanbury.

roughly prepared to catch the drip. Then the branches are lavishly scarified with superficial incisions. The resinous juice immediately begins to exude and drips to the earth, where, of different qualities as concerns cleanliness, it gradually hardens. It is thus a conglomerate of isolated tears, agglutinated fragments, and masses of uneven consistence, the quality being in accordance with the foreign matter present, such as fragments of bark, leaves, sand and dirt. Since a single large shrub is capable of producing ten to twelve pounds, and the resinous tears drop in profusion beneath the shrubs, the glitter of the crystal masses on the limbs, in the sunshine, is very pleasing.

When the fallen tears are dry, or hard enough to be handled, the mastic is picked up by means of tongs or pinchers, put into baskets, and sold to local dealers. It is then called kilista.⁴ The merchant employs girls and women to separate the grades, in which the large, single, transparent tears are "first." This quality is largely used by the rich Turkish ladies, who chew it as a breath perfume. The irregular, semi-opaque masses constitute the second quality, whilst the mixture of small fragments of all consistencies makes a third, very low grade.

Opalescence or dulness of mastic globules or tears may be due to dust on the surface, adhering impurities, scratched or abraded surface. In order to brighten it, the hard, dry fragments are placed in tanks of cold water, and hand washed, sometimes with a preliminary scrubbing with soap-suds. The friction between the fragments removes the dust, and brightens the surface to a glass-like transparency. This manipulation is most successful in cool, dry weather, October and throughout the winter being the season selected.

Steamers touching at Chios are boarded by men with baskets of peculiarly shaped little earthen vases filled with fine chewing mastic, which they sell for 2½ piastres each. These have been celebrated from "time immemorial," and are today in form and size as they were in times gone by.

Mastic is gathered from June to September, the process being disturbed if there be excessive rains. No adulterations of mastic are consummated in Turkey, but, since the drug is offered elsewhere cheaper than it is supplied in Smyrna, where the product of Chios naturally gravitates, it may be inferred that manipulative processes are elsewhere possible.

⁴ This word is spelled for me by Mr. Alpiar of Smyrna.

Commercial Features.—As is shown in our historical introduction, mastic was once one of the important Oriental products. As already stated, it has from times gone by been prized by the ladies in the rich Turkish harems as a breath perfumer, and is yet so employed by the Turkish people. That this use is not illogical from a sanitary stand is shown by the fact that mastic carries a decided volatile aromatic that is powerfully antiseptic, which cannot be said of all “chewing gums.” Possibly the nearest American chewing-gum approach to mastic in this sense, is the natural “spruce gum” of the north, or the “sweet gum” of the middle west and the south, both of which carry breath-sweetening, antiseptic aromatics. Mastic is to be found in the Turkish bazaars generally, being displayed in the shop in separate piles of different qualities. Choice tears are often sold in boxes holding about an ounce, labeled properly. The price was formerly as high as Forty-five Dollars per kilogramme, but is now about Two Dollars, the second and third qualities ranging from One Dollar to One Dollar and Twenty Cents per kilogramme. About 200,000 kilogrammes are produced each year, of which 170,000 kilogrammes are exported. Its field as a varnish-maker is much restricted, owing to the abundance of less costly resins; whilst as a constituent of pharmaceutical preparations, such as ointments, in which, during Mediaeval times, mastic was important, is now practically obsolete.

Raki, or *Rakee* or “*Mastic*.” This is a popular, mastic-flavored, alcoholic cordial liquor, much drunk by the non-Moslem populations of some parts of Turkey, but not by Mohammedan people, who, so far as I could determine, use no alcoholics. This drink is made by distilling a mixture of mastic and anise with strong wine or alcohol, the following being the formula of Mr. Agop Alpiar:

Take of

Alcohol 35 per cent.	1,000	c.c.
Aniseed oil	2.5	gm.
Mastic	15	gm.
Potassium carbonate	3	gm.

Mix together and distill, slowly reserving the fractions as follows:

No. 1	250	c.c.
No. 2	350	c.c.
No. 3	160	c.c.

To No. 2 (350 c.c.) add 10 grams powdered sugar. This is *Raki* or *Rakee*, the drink known also as *Mastic*.

After this process, the drink subsequently is continuously made as follows:

Mix No. 1 (250 c.c.) with No. 3 (160 c.c.) and add water, 90 c.c.; alcohol (35 per cent.) 500 c.c.; aniseed oil 1.25 gm.; gum mastic 7.5 gm.; and potassium carbonate 3 gm.

Distill as before, the second portion (350 c.c.) constituting *Raki*. Thus the process may be continued indefinitely, the second fraction of distillate being reserved for use.

The inferior grades of mastic are utilized in making this drink, of which 300,000 litres are estimated as the yearly output.

Raki or *Mastic* is a colorless, transparent liquid, of a pleasant, aromatic, anise-mastic flavor. The drinker does not take it clear, but adds to it about one third its bulk of water, which by precipitation of the volatile oils, turns the mixture milky. Owing to its strong alcoholic composition, this drink is used in moderation, but to Americans it does not appeal. It reminded me of *paregoric*, rather than of a grateful cordial.

Confection of Mastic.—A much-prized confection of mastic is prepared by making a syrup of sugar, and when it is reduced by boiling to a very thick consistence, stirring into it a sufficient amount of powdered mastic⁵ to flavor it. This produces a stiff confection of a pearly white color, that I was informed is especially a favorite with the Greeks. It is served as a course by itself, with a cool drink, or as a separate course of sweet after a meal. The following formula was given me by Mr. Lymberis of Smyrna.

CONFECTION OF MASTIC.

Sugar	3 lbs.
Water	2 pts.
Citric acid	1 dram
White of one egg.	
Mastic, powdered	$\frac{3}{4}$ oz.

Dissolve the sugar and acid in the water, and stir in the white of egg. Boil, skimming occasionally, until the thick syrup will retain

⁵ Powdered mastic is made by mixing enough sugar with hard, small tear mastic to prevent its agglutination when rubbed in a mortar. Like camphor, to which a few drops of alcohol are added, it cannot be powdered alone.
J. U. L.

its form when dropped on a piece of cold marble, or when a small amount is poured into cold water. Remove from the fire, cool in a capacious vessel, and then stir in the powdered mastic. In this connection it may be stated that an item of great interest to me was the numberless forms of sweets and cakes the Oriental people consume.

NOTE ON THE DETERMINATION OF BORIC ACID BY TITRATION IN THE PRESENCE OF GLYCEROL.

By B. H. ST. JOHN.

The method usually given for the titration of boric acid is as follows:

Add methyl orange and neutralize with normal sulfuric acid, adding a few drops in excess, then boil to expel carbon dioxide, cool and exactly neutralize with $N/10$ sodium hydroxide solution. Enough glycerin is then added so that the solution shall contain at least 30 per cent. and the solution titrated to a pink color with phenolphthalein.

In the course of some determinations the author noted that in the neutralization to methyl orange with $N/10$ sodium hydroxide solution after boiling off the CO_2 , a very slow and unsatisfactory color change occurs. With the hope of obtaining a sharp color change methyl red was tried in place of the methyl orange. The change of color, as is usual with methyl red, was quite sharp and entirely satisfactory.

The necessity then arose of checking the accuracy of the results obtained by using methyl red in this titration.

Accordingly a sample of boric acid was prepared by recrystallizing a commercial product from hot water. The crystals after being sucked as dry as possible on the filter were dried over conc. sulfuric acid.

Four solutions were prepared by dissolving 0.2000 Gm. of this pure boric acid in about 30 Cc. of water. To two of these methyl orange was added, and to the other two methyl red. These solutions appeared acid to methyl red but alkaline to methyl orange. However one drop (about 0.03 Cc., $N/10$ alkali sufficed to cause the methyl red to indicate a neutral state. And 0.10 Cc. $N/10$ acid

changed the methyl orange from the distinctly alkaline yellow color to the neutral tint. The sharpness of this color change with methyl orange seems to indicate that it is not the boric acid which causes the slow color change noted.

After the neutralization of the solutions, glycerin was added and then titrated to a pink color with phenolphthalein. The boric acid calculated from these titrations averaged, in the solutions neutralized to methyl orange 0.2007 Gm., in those neutralized to methyl red 0.2001.

When glycerin is added to a solution containing methyl red the indicator changes its color to red and as the titration proceeds the red color fades slowly, the point at which the indicator is half transformed occurring when about half the alkali necessary for titration with phenolphthalein has been added.

TITRATION OF BORIC ACID IN SOLUTIONS CONTAINING SODIUM CARBONATE.

Several solutions were prepared containing in each 1 Gm. sodium carbonate with a known amount of boric acid, thus simulating the conditions met with in the determination of boric acid. The titrations were carried out according to the method given below. The endpoints obtained with methyl red in the neutralization of excess acid were as sharp as usual but those obtained with methyl orange were, as the author had noted before, indistinct. Can it be that the endpoint of methyl orange is affected by a considerable amount of salts in the solution titrated? The results of these titrations are given in the attached table.

METHOD.

The solution was carefully neutralized in the cold with normal sulfuric acid and about 0.2 to 0.3 Cc. added in excess, the beaker being covered with a watch glass meanwhile to avoid loss by effervescence. The solution in the beaker, still covered with the watch glass, was quickly heated to boiling and boiled about 1 minute. In the case of the solutions in which methyl red was used as indicator, if the color had faded and become alkaline, normal acid was added until the red color was restored and the boiling continued for 1 minute. The solutions were then cooled to 20 to 25° and neutralized with tenth normal sodium hydroxide solution. The neutral point with methyl orange being taken as that point where a clear yellow

ment of female troubles. Several of these were found to give Börntrager's test for emodin. However, other tests failed to classify the emodin-like material as any of the common emodin-bearing drugs, *i. e.*, aloes, cascara, rhubarb or senna.

Knowing the common use of the *Viburnums* in preparations designated for the treatment of female diseases, the idea suggested itself that an uncommon emodin-like substance might occur in the commercial drug or fluidextract, or perhaps was a common adulterant. Accordingly Börntrager's test was applied to samples of commercial fluidextracts of *Viburnum opulus* and *Viburnum prunifolium* which were available.

The test was carried out in the following manner:

The fluidextract in a separatory funnel was diluted with about three volumes of water, about 5 Cc. concentrated hydrochloric acid added, and the mixture shaken with about one fourth of its bulk of petroleum ether. After settling the petroleum ether was decanted into a test tube containing 2 to 3 Cc. of 10 per cent. ammonia water, and allowed to stand, whereupon the crimson color appears at the juncture of the two liquids and gradually diffuses down into the ammonia.

The fluidextract of *Viburnum prunifolium* gave only a faint yellow color, while the fluidextract of *Viburnum opulus* gave a very characteristic test.

Considering the possible adulteration of this fluidextract of *Viburnum opulus*, a sample of cramp bark—labeled *Viburnum Opulus* U. S. P. VIII—was obtained and a fluidextract prepared from it according to the U. S. P. VIII. (A portion of this sample was submitted to the Bureau's pharmacognosist for examination, but a report identifying this as *Acer spicatum* was not received until the author, then working in the laboratory of the American Medical Association, had satisfied himself that such must have been the case.) The fluidextract prepared from this sample was tested immediately after its preparation by Börntrager's test as given above, and was found to give the test only very faintly.

About eight months later Dr. W. S. Hubbard's work on the separation of the common emodin-bearing drugs again brought to the author's mind this question of an emodin-like substance in *Viburnum opulus*—or rather *Acer spicatum*. Hubbard found that ether was more satisfactory than petroleum ether in Börntrager's test since the emodin or emodin-like material is more soluble in the

former. He also found that the ether extract from rhubarb, obtained in a process similar to that used for Börntrager's test, when shaken with a saturated solution of ferrous sulphate, imparts a deep blue color to the aqueous solution; also, that when the same ether extract was shaken with calcium hypochlorite solution a red color developed in the aqueous solution.

The fluidextract of *Acer spicatum* (supposed *Viburnum opulus*) which had been prepared eight months before, was examined by these tests in the following manner:

The diluted, acidified fluidextract was shaken with one eighth of its volume of ether (not petroleum ether) and the ether layer decanted off and used for the tests. When underlaid with 10 per cent. ammonia water a brilliant red ring appeared at once. When shaken with a saturated solution of ferrous sulphate the same deep blue color found by Hubbard with rhubarb extracts appeared in the aqueous layer. However, when shaken with calcium hypochlorite solution, only a faint yellow color appeared in the aqueous layer.

The fluidextract itself appeared to have become darker in color.

These tests were also tried on several extracts of *Viburnum prunifolium* with negative results, only a slight yellow color being imparted to the aqueous solution in any of the tests.

Some months later the author entered the Laboratory of the American Medical Association. There were available samples of fluidextracts of *Acer spicatum* and *Viburnum opulus* prepared by Mr. L. E. Warren from drugs which had been carefully identified by a pharmacognosist. The fluidextract of *Acer spicatum* was about four months old when tested, that of *Viburnum opulus* thirteen months.

These were subjected to the above tests. The fluidextract of *Acer spicatum* gave the tests described very positively, just as the fluidextract which the author had prepared had done. That of *Viburnum opulus* gave results exactly similar to those previously obtained with fluidextracts of *Viburnum prunifolium*.

The author was thus led to believe that the sample from which the fluidextract on which he had worked previously had been prepared was in fact *Acer spicatum*. The report of the Bureau's pharmacognosist later bore out this fact.

A fresh fluidextract of *Acer spicatum* was prepared from the standardized material available. Immediately after preparation it was found to give the tests with ammonia water and ferrous sulphate

solution described above, but, as had been noted before, the color obtained in the test with ammonia water is not as intense as that obtained with older extracts. This apparent increase, on aging, in the amount of the material which gives the test with ammonia, as indicated by the intensity of this test, opens the question: is it not present originally as a different compound which is changed either by simple oxidation or by means of ferments existing with it in the bark, into the substance which gives the reaction?

Farwell (*Bull. of Pharmacy*, 1913, XXXIII, p. 65) points out that most of the drug sold as *Viburnum opulus* is in fact *Acer spicatum*. Kraemer in the second edition of his pharmacognosy also states that the drug described in the U. S. P. VIII is in fact *Acer spicatum*.

This accounts for the fact that several commercial fluidextracts of *Viburnum opulus*, as well as a few proprietary remedies claiming to contain *Viburnum opulus*, gave the tests described above.

SUMMARY.

Acer spicatum contains a substance which gives a crimson color with ammonia, and which may be similar to the emodins of the common cathartic drugs. It also contains a substance which gives a blue color with ferrous sulphate solution similar to that obtained with rhubarb.

Further it seems that these two reactions should be of value for the identification of extract of *Acer spicatum* in medicinal preparations. Hubbard has shown that rhubarb, alone of all the common "emodin-bearing" cathartics, gives the blue color with ferrous sulphate solution. Rhubarb is distinguished from *Acer spicatum* by the red color which the former gives with the calcium hypochlorite test. The identification of *Acer spicatum* in the presence of rhubarb, of course, cannot be accomplished by these tests.

Contribution from the Laboratory of the American Medical Association.

THE REASONS FOR SOME OF THE CHANGES IN THE
FORMULAS OF GALENICALS MADE IN THE NINTH
REVISION OF THE UNITED STATES
PHARMACOPŒIA.¹

BY GEORGE M. BERINGER, PH.M.

Compliance with the legal standards, if there was no other reason, would necessitate a study of the changes made in the Ninth Revision of the Pharmacopœia. As my assignment in the symposium of this evening has been restricted primarily to Extracts, Fluid-extracts and Tinctures, I will, necessarily, limit my remarks very largely to the changes made in the formulas for certain of these galenical preparations. To the pharmacists, these are of the first importance and the users of the book should certainly understand why the changes have been made.

While the reasons for some of the changes may be apparent, the writer is aware, from the criticisms and queries propounded, that the reasons for many of these are not generally understood. Hence, it appears that this phase of the subject is worthy of special consideration and that an explanatory paper on pharmacopœial changes, even though it may sound elementary to some of my hearers, may not be an undesirable subject to present to this audience and, at the least, it may be of some assistance to students.

The changes in the titles of fluidextracts, extracts and tinctures have not been very numerous or important. The changing of the title Fluidextractum Rhamni Purshianæ to Fluidextractum Cascaræ Sagradæ was in recognition of the almost universal practice of physicians in using the latter title. The custom of physicians in prescription writing not infrequently determines changes in pharmacopœial titles.

The adoption of Cardamom Seed instead of Cardamom Fruit necessitated a reduction in the amount of Cardamom directed in several of the formulas, such as Compound Extract of Colocynth, and in Tincture of Cardamom and Compound Tincture of Cardamom, as the inert capsule is eliminated.

Economic reasons, at times, have decided changes. An instance of this is seen in the official oleoresins, which, with the exception

¹ Read at the meeting of the Philadelphia Branch of the A. Ph. A., November 14, 1916.

of Oleoresin of Cubeb, are again directed to be made with ether as a solvent instead of acetone. In the Eighth Revision, acetone was directed in place of ether, because at that time the former was cheaper. As it is now permissible to use denatured alcohol in the manufacture of ether, that solvent is made so cheaply that it is again advantageous to use it in place of acetone.

One of the most noteworthy advances in the present revision has been the adoption of introductory chapters and the classifications and type processes given under Fluidextracts and Tinctures, thus saving a number of pages in the book and avoiding the unnecessary repetition of instructions. It is hoped that this attempt at condensing formulas will prove satisfactory and may be still further extended in future revisions.

The popularity and extensive use of powdered extracts required pharmacopoeial recognition of a number of the extracts in this form. Among these may be mentioned Powdered Extracts of Aconite, Belladonna Leaves, Colchicum Corm, Gelsemium, Hydrastis, Rhubarb, Stramonium and Viburnum Prunifolium. In addition, Purified Oxgall is now official in the form of a powdered extract, and this class of powdered extracts will probably be added to in the future revisions.

The subcommittee recommended that a distinct class of Pulvextracta should be made so as to distinguish these from the pilular extracts. The conservatism of the General Committee of Revision, however, decided that the pilular or solid extracts and the powdered extracts should not be separated but all retained under the one class of Extracta and that in the monographs where both forms were recognized, the formula for the pilular extract should precede that for the powdered extract.

The preparation of powdered extracts presented some worrisome problems for the consideration of the subcommittee. In order to obtain a concentrated extract freed as far as possible from mucilaginous and gummy extractives, so as to permit of powdering and dilution in the form of a permanent powder, higher alcoholic menstruums had to be adopted than were required, as a rule, for the pilular extracts. Where the drug contained any appreciable amount of oil or fat, it was found that this had to be removed before a satisfactory powdered extract could be produced. Hence, in the Powdered Extracts of Aconite Root, Colchicum Corm, Nux Vomica and Physostigma, purified petroleum benzin extractions had to be made

to remove the fat, and in some cases, the recovery of the alkaloid from the benzin solutions became necessary. These added manipulations complicated somewhat the processes.

The standardizing of potent galenical preparations, wherever possible, is now an established principle in our pharmacopœia, and the ninth revision has carried this out more fully than heretofore. In the Extracta, this presented to the committee the problem of selecting proper diluents by which concentrated extracts could be reduced to the standard adopted. Our experiments led to the adoption of powdered starch dried at 100° C. or, in some cases, a mixture of powdered and dried starch and magnesium oxide as the diluent for powdered extracts. In the introductory chapter on Extracts, however, permission has been given to the manufacturers to use other inert diluents, such as sugar, sugar of milk, powdered glycyrrhiza, magnesium carbonate, or the finely powdered drug or marc from which the extract was made. A satisfactory diluent must be inert from a therapeutic standpoint, as well as chemically. It is difficult to select one substance that will prove preëminently satisfactory for all of the extracts. The committee had some difficulty in coming to a conclusion as to the proper diluent to recommend for reducing the standardized solid extracts. The final selection was glucose, as possessing the requisite qualification of being inert. Yet this has not proven altogether satisfactory and it may be possible that some other substance may yet be proposed as a substitute for glucose, and suggestions in this respect are invited.

The selection of a proper menstruum for each extract likewise required considerable experimentation. The U. S. P. VIII directed that Extract of Belladonna Leaves be made with a menstruum of two volumes of alcohol and one volume of water. With many samples of the drug, the manufacturers found that if the drug was completely exhausted with this menstruum that the yield was large and the extract was deficient in alkaloidal content. Hence, in the U. S. P. IX, a stronger alcoholic menstruum has been directed, namely, three volumes of alcohol and one volume of water, so as to reduce the amount of extractive and permit of maintaining the alkaloidal standard.

Extract of Ergot, U. S. P. VIII, was a roundabout process copied after the British Pharmacopœia and yielded a small amount of extract associated with sodium chloride and at a very high cost. The committee were convinced that hydrochloric acid in proper

proportion should be added to the alcoholic menstruum used in the extraction of ergot. Several of the samples of ergot worked with by the committee contained relatively large proportions of oil and unless this was removed, the resulting extract was granular and oily. Hence, in order to obtain a smooth and homogeneous product, the oil had to be removed from the ergot by purified petroleum benzin before it was percolated with the alcoholic menstruum.

In Pure Extract of Glycyrrhiza, two changes are to be noted: The first is the use of chloroform water, following the initial menstruum a mixture of ammonia water and water, to complete the exhaustion of the drug. The purpose of the chloroform water is that decomposition in both the drug and in the percolate before concentration, which is prone to take place in warm weather, may be prevented. The second change is the omission of the five per cent. of glycerin which was directed in the eighth revision. Experience has shown that pure extract of glycyrrhiza made with this small amount of glycerin is apt to become moldy. This is possibly due to the percentage of glycerin being insufficient to act as a preservative, and in this dilution it actually serves to provide a suitable field for the culture of molds.

A small percentage of tartaric acid was found to aid materially in the exhaustion of hydrastis. Hence, in the Powdered Extract of Hydrastis, 5 grammes of that acid is directed for each 1,000 grammes of drug extracted.

In the U. S. P. VIII formula for Extract of Nux Vomica, the nux vomica was first exhausted with a menstruum of acetic acid and water, and the concentrated acetic extract then treated with alcohol. In the formula of the U. S. P. IX, the extraction of nux vomica is made with a mixture of three volumes of alcohol and one volume of water, which menstruum extracts the drug and yields an extract which, when purified by the removal of the fat, appears to be entirely satisfactory.

Extract of Malt, instead of being directed to be evaporated "to the consistence of thick honey," which is not at all definite, is now directed to have a specific gravity of not less than 1.35 nor more than 1.40.

The fluidextracts recognized in the U. S. P. are, in number, greatly in excess of those recognized by any of the other pharmacopœias. In the endeavor to improve on the U. S. P. VIII formulas, the subcommittee made several hundred experiments trying

various menstruæ and methods of manipulations. For the first time in the revisions of the U. S. Pharmacopœia, fractional or divided percolation is directed. This process, Type Process C, is now not only permissible, but is officially directed to be employed in the fluidextracts of aconite, aromatic powder and bitter orange peel.

The type samples prepared by several of the committees which had worked with this class of preparations in the previous revisions had been preserved and reports on these were secured. The original samples, wherever available, were carefully inspected, and the changes both in amount and character of precipitate noted. The experiments led to the adoption of a number of changes in the menstruums directed and, for several, entirely new formulas are introduced.

In the following Fluidextracts, an increase in the alcoholic strength of the menstruum directed is to be noted: Bitter Orange Peel, Belladonna Root, Buchu, Guarana, Hyoscyamus, Pilocarpus, Podophyllum, Sarsaparilla, Staphisagra, Sumbul and Uva Ursi.

Numerous complaints showed that it was practically the universal opinion that in the Fluidextract of Buchu of the Eighth Revision, the menstruum of three volumes of alcohol and one volume of water was incorrect, and alcohol is now directed.

A reduction in the alcoholic strength of the menstruum is to be noted in the following Fluidextracts: Gelsemium, Ipecac, Senna and Triticum.

The U. S. P. VIII directed that Fluidextract of Cascara Sagrada should be made with a menstruum of four volumes of alcohol and six volumes of water. Our knowledge of cascara sagrada and its constituents now permits us to direct the extraction of the drug with hot water and the addition of the alcohol to the concentrated aqueous percolate as a preservative only. This improvement has been made in both the fluidextract of cascara sagrada and in the powdered extract, in both of which the extraction of the drug is directed to be made with water.

The Aromatic Fluidextract of Cascara Sagrada of the U. S. P. VIII was criticized in several respects. First, the attempt to extract the glycyrrhiza along with the cascara sagrada by the use of magnesium oxide. The proper solvent for licorice is, beyond any question, ammonia water and the extraction of these two drugs should not be made together, as either magnesium oxide or calcium oxide is the required alkali for the extraction of cascara sagrada.

The flavoring with compound spirit of orange was likewise criticized. In the formula directed in the U. S. P. IX, these objections have been met by directing the use of pure extract of glycyrrhiza and a change in the aromatics to a combination of the oils of anise, cassia, coriander, and methyl salicylate. Any slight tinge of bitterness remaining is drowned by the further addition of 1 gramme of saccharin to the 1,000 mils of product.

In Fluidextract of Cinchona, the addition of 100 mils of diluted hydrochloric acid to the menstruum was found necessary in order to exhaust the drug. Without this addition of acid, the resulting fluidextract failed to represent even approximately the total amount of alkaloid in official cinchona bark.

In Fluidextract of Colchicum Seed, while no change is made in the menstruum of two volumes of alcohol and one volume of water, some means had to be adopted to remove the oil which is extracted, possibly largely mechanically, and separates in the fluidextract. Hence, in the formula for this fluidextract, the preliminary treatment of the drug with purified petroleum benzin is now directed.

The Digitalis preparations present an interesting study. It developed that in the preparations of digitalis containing a large percentage of water, deterioration rapidly takes place. Further, that the deterioration in the presence of acids was very much more rapid and that an acetic preparation of digitalis very soon lost its efficiency. This can be explained on the ground that digitalis contains glucosidal principles and likewise an acid constituent, and in aqueous or dilute alcoholic preparations a reaction takes place between these constituents by which the glucosides are decomposed. In the fat-free tincture of digitalis, the acid is neutralized and thus the increased permanency of this preparation is explained.

A material increase in the percentage of alcohol in the official preparations of digitalis was indicated and the fluidextract instead of being directed to be made with a menstruum of diluted alcohol, is now directed to be made with a menstruum of five volumes of alcohol and one volume of water. For the same reason, the alcoholic strength of the tincture has been increased by the use of a menstruum composed of three volumes of alcohol and one volume of water in place of diluted alcohol.

In Fluidextract of Ergot, the U. S. P. IX has returned to the recommendation of Dr. E. R. Squibb and directs in the menstruum the use of 20 mils of hydrochloric acid in place of 20 Cc. of acetic acid of the U. S. P. VIII.

In the Fluidextract of Frangula, the similarity of this drug to Cascara Sagrada has suggested that the same method of preparation should be adopted for both fluidextracts and this was found to be entirely feasible. So Fluidextract of Buckthorn Bark is now directed to be made by hot aqueous percolation and the alcohol added to the concentrated infusion as a preservative only.

In the Fluidextract of Glycyrrhiza, we note an entire change in the formula. The U. S. P. VIII directed the extraction of glycyrrhiza with boiling water, thus obtaining a large amount of inert matter which it was difficult to remove by the subsequent manipulation directed. The new formula directs the extraction of the drug with a menstruum of ammonia water and chloroform water, and completing the exhaustion with chloroform water. The first portion of the percolate is set aside as a reserve. The alcohol is directed to be added only as a preservative. The waste of this solvent in the previous formula is thus avoided.

In Fluidextract of Ipecac, the attempt has been made to produce a miscible fluidextract from which a syrup could be made by simple admixture instead of the roundabout process for the preparation of the syrup directed in the U. S. P. VIII. Instead of extracting the drug with a menstruum of three volumes of alcohol and one volume of water and obtaining in the product resinous and other inert materials which had to be precipitated out in the preparation of the syrup, the attempt was to produce by the use of a menstruum of diluted hydrochloric acid, alcohol and water, a miscible fluidextract. This appears to have been overlooked, however, in the syrup of ipecac, as the formula of the U. S. P. VIII has still been retained, and the syrup will unnecessarily contain acetic acid in addition to the hydrochloric acid.

In the Fluidextract of Lobelia, the menstruum formerly directed was a mixture of acetic acid and water. This is now displaced by a menstruum of acetic acid and diluted alcohol, which promises a stable and active preparation.

In the Fluidextract of Nux Vomica, the acetic acid directed in the U. S. P. VIII has been deleted from the menstruum, as a menstruum of alcohol and water in the proportion of three volumes of alcohol and one volume of water directed has been found to be satisfactory. Acetic acid dissolves from nux vomica substances which later continue to precipitate and cause trouble in the preparations and there appears to be no necessity for any acid in this fluidextract.

In Fluidextract of Squill, we have one of the most important changes made in this class of preparations. Squill presents a troublesome problem. Its large content of mucilage and sugar make it difficult to percolate with the ordinary solvents. The U. S. P. VIII directed that Fluidextract of Squill should be made by percolating 1,000 Gm. of the drug with a menstruum of acetic acid and water until 1,000 Cc. of percolate was obtained. No attempt whatever was made to exhaust the drug or to obtain a fluidextract of full strength, even if it were possible to carry out the instructions and percolate the drug with this dilute acetic acid menstruum.

The process now directed was proposed by Dr. J. M. Francis. The squill is first exhausted with a menstruum of two volumes of alcohol and one volume of water, and with a hydro-alcoholic menstruum of this strength, squill can be percolated. The percolate is then concentrated and alcohol is added to precipitate out the mucilage and sugars. The alcoholic liquid decanted from the syrupy residue is again concentrated and made up to the requisite volume by the addition of diluted alcohol. This is necessarily a tedious and an expensive process, but yields a fluidextract of squill which appears to be permanent and fully represents the activity of the drug.

In Fluidextract of Senega, a change in manipulation is to be noted. The alcoholic strength of the menstruum remains the same as in the previous edition, but no alkali is added to the menstruum. Solution of potassium hydroxide is eliminated from the formula and in place thereof ammonia water is added to the finished product until a faint alkaline reaction is produced. The reason for this change in manipulation is that precipitation and gelatinization in fluidextract of senega is prevented by maintaining an alkaline liquid. The alkali that gives the best results is ammonia water, and in order to insure alkalinity being maintained, this is added in slight excess to the finished product.

The Eighth Revision directed that Fluidextract of Senna should be made with a menstruum of diluted alcohol and that the drug should be previously percolated with alcohol to remove the griping principle. This preliminary treatment with alcohol and drying of the drug is very expensive. The U. S. P. IX endeavors to obtain the same results by preparing the fluidextract by using a weaker alcoholic menstruum composed of one volume of alcohol and two volumes of water and omitting the preliminary extraction of the drug with alcohol.

In the Tinctures, several changes are of special interest. In Tincture of Arnica, in order to insure the exhaustion of the drug, *interrupted percolation* is directed.

In Tincture of Cantharides, a process of maceration with warm alcohol is directed. The cantharides directed (10 per cent.) can never be fully extracted by the alcohol and all we can succeed in doing is to make a saturated alcoholic solution of the active constituent, and this is attained by macerating at a temperature of 50 to 55° C.

In Compound Tincture of Gentian, the addition of glycerin and the reduction of the alcoholic strength to that of diluted alcohol is to be noted.

In Tincture of Iodine, in order to insure the solution of the iodine, 50 mils of water per liter is added.

Tincture of Kino of the U. S. P. VIII was not a satisfactory preparation. The addition of glycerin and the attempt at filtration meant a long exposure with associated contamination which engendered enzymic action and the early gelatinization of the product. The U. S. P. IX directs the extraction of the kino in a flask with boiling water, the alcohol being added to the cooled decoction and the tincture decanted and strained. By this simplified process, exposure of the kino is avoided and a more permanent preparation is secured.

Tincture of Nux Vomica is now directed to be made directly from the powdered drug by percolation with the menstruum and then assayed, the standard being fixed at total alkaloids .25 Gm. in 100 mils instead of strychnine 0.1 Gm.

In Tincture of Sanguinaria, hydrochloric acid is directed in place of acetic acid, with the alcoholic strength of the menstruum remaining the same as in the previous revision. One has but to try the use of hydrochloric acid in the extraction of sanguinaria to note its value for this purpose.

In the Tincture of Strophanthus, we note a decided improvement over the formula of the U. S. P. VIII. Strophanthus is a drug that is very difficult to extract and its large percentage of disagreeable fat is another troublesome factor. The U. S. P. VIII directed that the tincture be made with a menstruum consisting of 65 volumes of alcohol and 35 volumes of water without previously de-fatting the drug. The resulting tincture was cloudy from separated oil and was exceedingly nauseating because of the presence of the fat.

The medical use of strophanthus is such that this nauseating tendency of the preparation should be eliminated. The formula of the U. S. P. IX is a decided improvement over that of the previous edition in that the drug is first de-fatted by preliminary treatment with purified petroleum benzin. The use of alcohol 95 per cent. as the menstruum is likewise to be commended as more nearly extracting the drug and yielding a more definite preparation.

THE SUCCESS OR FAILURE OF HIGHER EDUCATION IN PHARMACY.

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There exists at present very little, if any, difference of opinion on the question of the desirability and absolute necessity of thorough general and scientific training as a preparation for those who expect to enter the practice of pharmacy. Higher education is steadily gaining ground and making its new converts daily. Indeed, very often the men who have themselves never enjoyed the opportunities of adequate training are the very ones who insist most strongly that the young men and women entering this field should do so only after they have received a thorough preparation. Our state boards have almost without exception recognized the value of preliminary as well as properly organized technical education, and in their rulings have constantly sought to raise educational requirements. Our colleges of pharmacy are increasing their entrance requirements year by year and making their courses more thorough and comprehensive. Many of our schools have today requirements for entrance as high as some of the medical colleges of the country, and courses which require three or four full academic years for completion. The net result of this must be that we will have a much larger number of thoroughly equipped men in the future than we have had in the past. We may indeed congratulate ourselves that our calling is moving onward in this splendid way.

Let us now stop to ask ourselves seriously how long we may hope for the important advances we have mentioned to continue. What

factors are there which will determine the ultimate success or failure of higher education in pharmacy? No one person should be so bold as to attempt to answer this question outright. Innumerable factors enter into the solution of a problem of this sort, and in any one discussion it seems best to center all of one's thought and energy on a single phase, seeking to make this clear. I shall, then, in what follows attempt to review in another light a point of view which I have expressed several times before and which seems to me to be fundamental in any consideration of the future growth and successful development of pharmacy.

The point to which I desire to invite your attention may be briefly put in this way. *In proportion as we increase our educational requirements, we must also increase the unity and stability of our professional life.* There must be, in other words, something worth while for the prospective pharmacist to look forward to when he graduates. The business prospects in pharmacy, which are, to be sure, very important, we may leave out of consideration for the moment, since they enter only indirectly into a consideration of unity and stability in the sense in which we are using these terms.

We may admit at the outset that we do have a kind of unity, this largely, however, in the sense that most of us work in, manage or own retail drug stores, and therefore have economic interests in common. This type, however, will not suffice for us. Carpenters, plumbers and members of all of the trades have more of it than we have. It aims at mutual protection almost entirely, and nothing but that. *We need economic coöperation, to be sure, but we need even more a unity which makes us feel and act as if we were members of a really permanent profession.* The lack of this continually robs us of our real strength and makes many smile at the mere mention of such a thing as a professional side to pharmacy. We must build up and strengthen the professional side of our work if we hope to continue to enforce rigid requirements for admission to practice. What else can there be for the young man who is about to enter our ranks? Certainly not financial rewards, surely not an easy life. *He must receive compensation in part, at least, from a consciousness that he is a member of a calling which enjoys the esteem and respect of the public as well as of the other professions.* Only on such terms will he be willing to spend the time, money and energy which are needed in order to fit him for his work.

While it is impossible in any one statement to speak the literal

truth regarding conditions that obtain in all of the states of the Union, still it can be safely said that, taken as a whole, our pharmacy laws are in many vital respects *decidedly out of date*, and in woeful need of revision. *Our capacity to legislate has not kept pace with our business or professional growth, and while doctors, dentists and lawyers have secured much-needed legislation for themselves we have had to go away all too often empty-handed.* One very good reason for this is that we have not been sufficiently interested in demanding our rights, nor have we been able to bring enough pressure to bear to interest legislators in our behalf. Another and even more potent reason is that we have not enjoyed the respect of the public sufficiently to have created an adequate opinion in our behalf.

How, then, can we set about to secure a better reputation for pharmacy? Let us begin by attempting to become legally on par with the other professions. Let us ask the state for the same recognition that it now accords to law, medicine and dentistry. Let us substitute for annual registration a life permit to practise. Then and only then can we call ourselves pharmacists in any real, vital and significant sense.

The great pity is that some ardent workers for the good of pharmacy persist in confounding the question of the desirability of registration with the question of asking the state to grant life-long permits to practise pharmacy after proper examinations have been passed. The question of whether or not it is desirable to have annual registration to protect and adequately safeguard the pharmacists' interests does not at all enter into consideration. Let us register our pharmacists annually or semiannually if we believe such measures are necessary. We may even do as Illinois and other states are doing with reference to registration of physicians; viz., deny the right to practise unless they are registered with the county clerk of the county where they reside. There are a hundred schemes that could be devised to secure these ends. We may even devise successful means of collecting enough fees to maintain our state boards until the legislatures become convinced that it is the duty and privilege of the states to appropriate for their support. *But let us speedily and forever abolish the present degrading annual procedure of granting new leases of professional life at one dollar and fifty cents per annum.* As a practical proposition it does of course "bring in the money." No one can deny that. It does help the secretary to collect the money the board needs and he does not

need to ask twice for it either. *But should any body of men have the power to deprive a man of his life work, with the years of toil and study which it has cost him, simply because he fails to pay an annual fee?* Such a condition does not find its counterpart in our entire social order. We are so accustomed to buying our "annual immunity" that most of us have come to feel the process entirely natural, and we either go blindly on thinking that it is for our own good, or we say, "Well, it's only a dollar and a half a year—that's fairly cheap. What's the use bothering about it? I'm willing to pay that much to keep protected and to prevent men from practising who have no license." We go on to build up pharmacy at the top and we leave the same old inadequate foundation below, without an added stone to strengthen it. A life permit to practise pharmacy would do more than any one other thing possibly could to create unity and give stability to our calling. It would help to create a professional atmosphere and lend dignity to our work. It would help to bring about conditions that would best enable us to continue our policy of higher education, which is vital to our existence.

EARLY CHEMICAL MANUFACTURING IN PHILADELPHIA.

BY PROFESSOR SAMUEL P. SADTLER.

The earliest efforts at chemical manufacturing in Philadelphia as in other parts of the American Colonies were undoubtedly due to the feeling of the colonists that they must free themselves from oppressive trade regulations of the mother country. We read in the sketch of the career of one of the pioneers of Philadelphia chemical industry, the following:

The earliest efforts of the colonists—the manufacture of coarse, woolen fabrics in 1719—so excited the jealousy of Great Britain that the English Parliament declared "that the erecting of factories in the colonies must be discouraged at all cost," so every enterprise met with great opposition. It was not, however, until 1774 that Pennsylvania became so aroused by English oppression of her industries that a convention of delegates from all the counties was held in Philadelphia. Joseph Reed was president, Jonathan B. Smith, John Benezet and Francis Johnston were secretaries. The convention earnestly enforced the strict observance of non-importation agreements and to provide against the inconvenience which might result, recommended the

preservation of sheep until they were four years old, and the immediate establishment of the manufacture of woolens, salt, saltpetre, iron, nails, copper in sheets and kettles, malt liquors and gunpowder especially, "as there existed a great necessity for the latter, particularly in the Indian trade." The convention advised the exclusive use of home manufactured articles and urged that associations be immediately formed for the encouragement of all domestic productions.

This feeling only came to a head about the time of the beginning of the Revolutionary War. Prior to that in the Colonial period, the production of potashes and lime, some attempts at the extraction of salt from brines, tentative efforts at the making of gunpowder, and domestic utilization of the potashes in soap-boiling about comprised the chemical manufacturing industry. Of these the most important was the manufacture of potash from wood ashes. Scharf and Westcott's History of Philadelphia states that in 1772 the value of the potashes manufactured in America was £50,000.

As before stated, the oppressive trade regulations of England acted as an impelling force in the establishment of chemical industries. Thus the exportation of powder and its materials from England was prohibited by an order of Council of October 19, 1774, so that the American Colonies were made dependent on other sources for their supply.

The Continental Congress in various ways encouraged the erection of powder mills and also the production of nitrate of potash. Congress in 1775 published a manual giving directions for making saltpetre, and about the same time the "Committee of the City and Liberties" erected a large saltpetre works on Market Street for the double purpose of making saltpetre and also to instruct such as were willing to engage in the making of this very necessary article for the powder mills.

The manufacture of gunpowder was very extensively carried on during the Revolution in nearly all of the American Colonies. A very large proportion of this powder, however, was made in Pennsylvania. Philadelphia was among the first places in which powder mills were successfully operated.

Early in the Revolution a public powder mill was established in or near Philadelphia by the Assembly, while Congress opened, and for some time operated, what was known as "The Continental Powder Mill." Congress also offered advances to such persons as would be willing to establish powder mills within fifty miles of the city of Philadelphia, and this offer was taken advantage of by many who subsequently supplied a liberal proportion of the powder used in the Continental Army.

But to come back to the efforts of the Colonists to free themselves in other lines from dependence on the mother country, we

read in the sketch of the career of Samuel Wetherill, from which we previously quoted:

Samuel Wetherill was one of the promoters and managers of the "United Company of Pennsylvania for the establishment of American Manufacturers." He embarked his whole soul in the business, and in 1775 set up at his own dwelling house in South Alley, then called Hudson Square, now Commerce Street, a factory for jeans, fustians, everlastings and coatings. (Fustian is a cloth, the warp of which is linen and the woof thick cotton. It derived its name from Fusht, a town on the Nile where it was first made.) This business was just for spinning and carding and did not necessitate any heavy machinery, but in order to properly prepare these goods it was necessary to have them dyed. There being no dyers in Philadelphia equal to the task, Samuel Wetherill was obliged to undertake this branch of the business also. His house on South Alley is described as being of two frames, which I suppose means what we would call a double house, and he was probably able to turn one frame into a factory and let his family live in the other. However that may be, a little inconvenience more or less in those days did not matter, where all were working together for the common good and for the highest principles. . . . So it was that Samuel Wetherill, who started as a carpenter, became a weaver, then chemist, etc., and when the war broke out he did not scruple about entering into a contract with Congress to furnish clothes for the patriot troops, being a patriot himself; and it is said that his timely shipment of supplies to Washington's little army at Valley Forge saved it from disbanding. This, his allegiance to his country, and his expressed approval of bearing arms for its defense, were the cause of his being "dealt with" by the Society of Friends and cut off from religious communication and fellowship with them. Thereupon he and a few others who had publicly taken the oath of allegiance to the American cause started the Society called the "Free or Fighting Quakers."

Probably the first to inaugurate the manufacture of chemicals, as such, in this country, was the firm of Christopher, Jr., and Charles Marshall, sons and successors of Christopher Marshall, an early druggist and one of the original "fighting Quakers" of Philadelphia; this firm had, as early as 1786, entered quite extensively into the business of making muriate of ammonia and Glauber's salt. The factory is described by Watson, in his "Annals of Philadelphia," as being a grim and forbidding-looking building on Third Street near the stone bridge over the Cohocksink Creek. This firm is said to have developed an annual output of upwards of 6,000 pounds of muriate of ammonia; quite an achievement for that time.

MANUFACTURE OF SULPHURIC AND OTHER ACIDS.

Let us now take up the beginnings of the manufacture in Philadelphia of one of the fundamentally important chemicals, viz., sulphuric acid. This substance is recognized as the basis of all chemical industries and its manufacture must precede that of most other

chemicals. The theory of the lead chamber process was already understood by chemists, by the middle of the eighteenth century. Ward had made it in England in 1740 on a large scale in glass vessels, and Dr. Roebuck first used leaden chambers instead of glass in Birmingham in 1746. The first lead chamber was erected in France at Rouen in 1766.

Mr. John Harrison, the son of Thomas Harrison, a member of the Society of Friends, was an early Philadelphia druggist who had completed his education by spending two years in Europe, in part under the instruction of Dr. Joseph Priestley, the famous English chemist. Upon his return he began, in 1793, the manufacture in Philadelphia of various chemicals, and notably of sulphuric acid. He had at first a lead chamber capable of producing 300 carboys of acid per annum, and his laboratory at this time was on the north side of Green Street, west of Third. In 1804, he established a new factory at Second and Huntingdon Streets, near Frankford Road, Kensington, but continued for a time the work on Green Street. In 1807 he built what was for that time quite a large lead chamber; it was 50 feet long, 18 feet wide, and 18 feet high, and capable of making nearly half a million pounds of sulphuric acid annually, the price of which was then as high as 15 cents per pound.

As is well known, acid produced in lead chambers, is not the oil of vitriol of commerce, and the only method known at that time to concentrate it to the required strength was by boiling it in glass retorts—a very precarious and dangerous process. The constant breakage of the glass largely increased the cost of the concentrated acid and the dangers of the work. To obviate this great trouble Mr. Harrison, in 1814, introduced the use of Platinum for the manufacture of sulphuric acid, for the first time, at least in this country. In the previous year, 1813, Dr. Eric Bollman, a Dane, had come to Philadelphia. Dr. Bollman was familiar with the metallurgy of Platinum, and a highly scientific man. He brought with him from France Dr. Wollaston's method for converting the crude grains of Platinum into bars and sheets. About the first use that Dr. Bollman made of these Platinum sheets was the construction, early in 1814, of a still for the concentration of sulphuric acid for the Harrison works. It weighed 700 ounces, had a capacity of 25 gallons and was in continuous use for fifteen years. This early application of platinum for such purposes was highly characteristic of the sagacity and ingenuity of the American manufacturer. At the time the use of this rare metal was a novelty in Europe and known only to a few persons and certainly entirely unknown in this country. It follows, therefore, that Mr. John Harrison was not only the earliest successful manufacturer of Sulphuric Acid in America, but the first in this country to concentrate it in Platinum.

Farr and Kunzi were next in Philadelphia to follow the lead of Harrison in making sulphuric acid which it is stated they did in 1812, and shortly thereafter Wetherill & Bros. also began the manufacture of sulphuric acid on the east bank of the Schuylkill River. Chas. Lennig, the founder of the present firm of Chas. Lennig & Co., Inc., also began the manufacture of sulphuric acid in 1829, Rosengarten & Sons shortly thereafter, and Carter & Scattergood in 1834 also were early manufacturers of sulphuric acid.

Nitric acid under the name of *aqua fortis* is mentioned in Scharf & Westcott's History of Philadelphia as made by Christopher Marshall, Jr., a Philadelphia druggist, at the close of the eighteenth century. A communication from Mr. Thos. Skelton Harrison says his grandfather, John Harrison, began to make both nitric and muriatic acids in 1804. Carter & Scattergood had it on their list of manufactures in 1834. Muriatic acid is also mentioned as made by this latter firm in the year 1834, as were tartaric acid and citric acid.

MANUFACTURE OF PAINT COLORS.

We have here another record of which Philadelphia may be proud. We have already referred to the energetic work of Samuel Wetherill in starting American lines of manufacture just prior to the opening of the Revolutionary War. About 1789 he began the manufacture of white lead in Philadelphia and persisted in it, despite great efforts made on the part of the importers to hinder him by under-selling and misrepresenting him. The first white lead factory of Samuel Wetherill & Sons was built in 1804 at the corner of Broad and Chestnut streets, but it was burned down a few years later, and in 1808 they erected a new factory at Twelfth and Cherry Streets.

His son, Samuel Wetherill, Jr., was the active man of the concern, and assisted his father in all business matters. The enforced experience which was pressed upon them during the Revolution, concentrated their attention upon the manufacture and sale of chemicals, and they went into the drug business. In 1785 Samuel Wetherill & Son were located in Front Street above Arch. Here, for many years, "Wetherill's drug store" was an old landmark, and the place at which sons and grandsons were brought up to the business. The Wetherills were the pioneers in the manufacture of white lead. They established it before the year 1790. They erected extensive white lead works near Twelfth and Cherry Streets, which were burnt down in 1813, but afterwards rebuilt. •

The fire which destroyed the white lead works proved to be incendiary and started by a young English officer the day before he sailed for England.

In October, 1811, Samuel Wetherill, Jr., obtained patents for a new mode of washing white lead and for screening and separating metallic from corroded lead in the process of making red lead, and using the first machine ever used for manufacturing purposes in the United States. This method has been generally adopted and used by all makers of lead.

The name of the first white lead firm was Samuel Wetherill & Son, Samuel Wetherill, Jr., evidently being the active member. After his father's death in 1816, Samuel Wetherill, Jr.'s, sons joined in the business and the firm became Samuel Wetherill & Sons. After the death of Samuel Wetherill, Jr., in 1829 it became Wetherill Brothers. The store of the firm was at 65 N. Front Street, the warehouse and mill of the old establishment were on Coomb's Alley, back of Second Street.

When the residence part of the city spread to Twelfth and Cherry Streets, Samuel Wetherill having bought ten acres of land on the bank of the Schuylkill River below Chestnut Street, there in 1847, his sons, Wetherill and Brother, built the white lead and chemical works and continue to this day.

John Harrison also began the manufacture of white lead in 1806. The firm of Mordecai & Samuel N. Lewis, which afterwards became John T. Lewis & Brothers, also began the manufacture of white lead in 1812, making three Philadelphia firms manufacturing paint colors at that time. These three earliest manufacturers of white lead and paint colors or their lineal successors have continued in business to the present time, or considerably over a century, and have done much to give Philadelphia its long continued prominence as a chemical manufacturing center.

Chromates were probably first made in Baltimore, though as early as 1816 a Mr. Wesener, a German chemist, had established himself in Philadelphia in the neighborhood of Broad and Cherry Streets, where he made chrome salts and chrome pigments in considerable quantities. Being nearer the source of supply of the raw material, the Baltimore manufacturers had a decided advantage, so much so that before the middle of the last century the business had drifted back to that city.

The manufacture of varnishes followed that of paint colors. Christian Schrack who was a manufacturer of paints in Philadelphia in 1816, later established the varnish manufacture, and already in 1836 an export trade in American made varnishes had begun.

The manufacture of shot by the granulation of lead while not properly called a chemical industry, is closely related to the lead pigment manufacture. This manufacture of lead shot was one of Philadelphia's earliest industries. From Winslow's "Biographies of Successful Philadelphia Merchants," page 142, we quote:

On the fourth of July, 1808, the corner-stone of the Southwark shot tower, in John Street, between Front and Second, was laid by the firm of Cousland, Bishop and Sparks, and the building was pressed forward rapidly to completion. Thomas Sparks paid particular attention to this branch of the business, and in a short time the patent shot of the firm became celebrated throughout the country. So long as this article was used by sportsmen and hunters, there seemed to be no difficulty about the propriety of the manufacture in the firm. But when the war of 1812 broke out, the firm then being Bishop and Sparks, the senior partner, who was a consistent member of the Society of Friends, felt conscientious scruples as to the rightfulness of continuing a manufacture which the United States now demanded should be turned to the production of munitions of war. John Bishop, therefore, withdrew from the firm, and retired from business.

Thomas Sparks, therefore, continued the business for several years alone. In 1818 he took into partnership his brother, Richard Sparks, and the firm continued at No. 49 South Wharves, as Thomas and Richard Sparks, the shot tower operations being in full play. It was necessary that they should reside near the tower, and accordingly Thomas had his house at No. 476 South Front Street and Richard at No. 478. This partnership did not last very long. Richard Sparks fell a victim to the yellow fever in the year 1821, and for many years Thomas Sparks continued at No. 49 South Wharves, and at the shot tower, without a partner. In the year 1838 he took in with him his nephew, Thomas Sparks, Jr., a son of Richard. The business was then conducted under the firm name of Thomas & Thomas Sparks, Jr., at the old stand, which from No. 49 South Wharves had become No. 49 South Delaware Avenue.

One of the lines of manufacture that contributed to make Philadelphia a great chemical center early in the last century was that of the yellow and red prussiates of potash. I have been furnished a private memorandum concerning the activities of the firm who began this industry and were active in it for many years.

Under the firm name of Carter & Scattergood a profitable chemical manufacturing business was conducted from 1834 to 1911; and was absorbed in the latter year by The Henry Bower Chemical Mfg. Co.

John Carter and Joseph Scattergood bought out the old established business of "John & Daniel Elliott" found in 1754 by their grandfather John Elliott.

The Elliotts' place of business and factory was originally on Front Street between Chestnut and Walnut Streets, but in 1812 the manufacturing work was transferred to a new factory which they erected at 19th and Pine Streets, John Carter becoming their apprentice January 1, 1816.

The list of chemicals produced by Carter & Scattergood was an extensive one, John Carter being the manufacturer and Joseph Scattergood the business man of the concern. It included Citric, Tartaric, Oxalic, Nitric and Sulphuric Acids, Bichromate and Prussiates of Potash and many other arti-

cles, but their operations during the first ten years of their business were on a scale which in this day would be considered quite small.

Yellow Prussiate of Potash was first made by them in 1834 (that being so far as known the first production of the article in America), but the demand was very small, only 472 pounds being absorbed by the market in that year. In 1835 the sales increased to 6,443 pounds, but it was not until 1843 that the demand became large, the sales amounting in that year to 69,470 pounds and rapidly increasing in the next two years, the sales in 1845 being 207,522 pounds.

The high price, over fifty cents per pound, and the keen demand of course resulted in active competition, and the market for many years was over-supplied.

In the year 1846 Carter and Scattergood began to produce Red Prussiate of Potash, being the first in America. This was a highly profitable branch of the business until the introduction of coal-tar dyes, as substitutes for prussiate colors on woolen goods, gradually displaced it in the most important field of consumption. Except for the manufacture of *Blue-Print Paper*, there is now very little demand for it.

Potash and ammonia alums were first made in Philadelphia by Chas. Lennig in 1837 and by Harrison Bros. in 1840.

Coming now to the early manufacture of medicinal or pharmaceutical chemicals which has long made Philadelphia famous, we find that George D. Rosengarten and Charles Zeitler as Rosengarten & Zeitler began the manufacture of chemicals in St. John Street, Philadelphia, about 1822. They were the first to manufacture the alkaloids of cinchona and opium in this country, having begun the manufacture of sulphate of quinine in 1823, of sulphate of morphia in 1832, and strychnine in 1834. The salts of quinine were also manufactured by John Farr in 1825.

These two firms and their successors have had much to do with the establishment of Philadelphia as a chemical manufacturing center. After the withdrawal of Mr. Zeitler, which took place within a year, Mr. Rosengarten continued alone, later taking in a Mr. Dennis. When this partner withdrew some twenty years later, the firm became Rosengarten & Sons, which business continued until the formation of the present combination with the other large Philadelphia manufacturer of medicinal chemicals, Powers & Weightman.

"Farr & Kunzi began the manufacture of chemicals about 1818. Abraham Kunzi, a Swiss by birth, retired in 1838, and the senior partner, John Farr, who had been born and brought up in England, associated with himself Thomas H. Powers and William Weightman, two young Philadelphians, who had been in the employ of the

firm for some time. The new firm name was John Farr & Co. This was later changed to Farr, Powers & Weightman, and, on the death of the senior partner in 1841, the firm name was again changed; this time to the title—"Powers & Weightman," by which it was so long known throughout the entire country. These two firms in 1905 united under the name of the Powers-Weightman-Rosengarten Co. and continue as probably the best known manufacturers of general and medicinal chemicals in the United States.

The history of the commercial production of pure glycerine is also of interest in this account of Philadelphia's chemical achievements.

The late Robert Shoemaker while making medicinal plasters had his attention directed by Prof. Wm. Procter to the residuum liquid which was obtained. From this he prepared the first glycerine made in this city, if not in America, in 1846, and this was exhibited by Prof. Procter to his class at the Philadelphia College of Pharmacy at the time. Mr. Shoemaker manufactured it for sale according to his statement for some years in connection with the manufacture of lead plaster.

The later development of the refining of waste lyes containing glycerine was also a Philadelphia achievement and was worked out by the late Henry Bower. By the courtesy of his son, Mr. W. H. Bower, I am allowed to quote from a private letter which gives the account of his work, in his own words:

Quite early in life, say in 1857, my attention was keenly directed to some mode of purifying these waste liquors of the Stearine Candle factories, and in that year I could have purchased the entire product of Crude Glycerine of the United States for a sum not exceeding \$5,000, although the manufacture of it was nearly if not quite as large then, as now.

I commenced work in earnest to experiment in purifying Glycerine in 1858—and expended long and weary efforts, all my earnings, as well as some borrowed money. I at first succeeded in producing an article sufficiently pure, for use in gas meters (in place of alcohol) to prevent freezing, and stoppage of the instrument—it was not however until about the middle of 1860 that I succeeded in making and placing in the market a "Pure Inodorous Glycerine"; even then the amount sold was quite insignificant. Inferior grades made their appearance about the same time in the West. The bland and neutral nature of the article, and the discovery of various uses for it, soon increased the demand to a marked extent; I was enabled from time to time to increase my works, and in increasing them was making steady inroad into the supply of the crude article. At this period—say in 1863—the business of refining Glycerine was scarcely known on the continent of Europe, and I

exported small quantities to Hamburg paying a profit; Belgium, France, Germany and Austria were immense producers of Crude Glycerine, but like its sister product here in previous years, it only found its way to the sea. As before stated, the use and sale of the Refined continued to improve, the crude growing more scarce each season, until a point has been reached when every available pound is worked into a valuable product. It would not be out of the way to place the total value of all the Glycerine sold in the United States at this time at half a million of dollars. This sum could never have been reached had it not been for the discovery of a mode for refining, to which, so far as this country is concerned, I lay claim; by a careful management of my business for some years I kept the process a secret, but in time some portions of it came to the knowledge of other persons, who have been enabled to produce very fair articles. There are besides myself, here, two refiners in Cincinnati, one in Chicago, and one in New York.

There were of course other drug and chemical firms who were well and favorably known in the early half as well as the later half of the nineteenth century.

We have already mentioned the name of Christopher Marshall, Jr., who was active in Revolutionary days. Himself the son of a druggist, he was succeeded by his son, Charles Marshall, and his grandson, Charles Marshall, Jr., who in 1814 established himself in the wholesale business at 310 Market Street.

With this Charles Marshall, Jr., entered as an apprentice Geo. W. Carpenter, who later became one of the most prominent as well as successful of wholesale druggists in Philadelphia. The old store of Carpenter & Henszey at Eighth and Market Streets I remember quite well as it stood about forty years ago.

A very well known drug firm of the latter half of the nineteenth century was that of Bullock & Crenshaw. They were the successors to Smith & Hodgson who established themselves as druggists at the corner of Sixth and Arch Streets in 1819 where they continued until 1849 when they disposed of their drug business to two of their employees who then formed the firm of Bullock & Crenshaw. This firm carried on not only a wholesale drug business but handled fine chemicals and chemical apparatus, supplying many colleges and schools throughout the country. In September, 1868, they moved to 528 Arch Street, where in larger quarters they carried on a flourishing business until the death of Mr. Chas. Bullock, the surviving partner.

The firm French, Richards & Co. was for many years one of the best known of Philadelphia drug firms at its centrally located

store, Tenth and Market Streets. The founder of this firm was Clayton French who in 1840 entered the drug business as an apprentice with a Dr. Edward S. Wilcox. This firm was disbanded in 1890 on the death of its founder, but in the meantime its extensive cement and plaster department which was started in 1852 at Callowhill Street and York Ave., had been erected in 1883 into a separate business of Samuel H. French & Co. This has since developed into a very extensive cement, plaster and dry color firm, now under the leadership of Howard B. French, a son of Samuel H. French of the original French, Richards & Co. firm.

In conclusion I wish to acknowledge my indebtedness to various friends for furnishing special information and the loan of papers, books and pictures of early chemical establishments. I would specially mention Mr. Wm. H. Bower, Mr. Wm. C. Carnell, Mr. Thos. S. Harrison, Dr. Ewing Jordan, the Librarian of the University Club, and Mr. Spofford, the Assistant Librarian of the Historical Society, Mr. Howard B. French, Prof. Henry Kraemer of the Philadelphia College of Pharmacy, and Mr. Martin I. Wilbert, formerly in this city but now in Washington, D. C. The last named published a valuable paper in the Franklin Institute Journal for May, 1904, on "Early Chemical Manufactures," from which I have quoted in the preparation of this paper.

NOTES FROM THE RESEARCH LABORATORY, PARKE, DAVIS & COMPANY.

SPECIFIC THERAPY IN DISEASES OF THE THYROID GLAND.

The study of the ductless glands comprises one of the most fascinating fields of medical research and investigations of recent years have afforded some startling revelations of the importance of the internal secretions in controlling physical and mental development, metabolism and the vital body functions. A practical aspect of this line of experimentation in the application of such knowledge to the specific treatment of diseases correlated with disturbed glandular functions. The thyroid gland, in particular, is interesting in this connection because specific measures have been developed for the treatment of diseased conditions associated both with deficient functioning and with excess secretion.

The three classical types of disease due to decreased thyroid

secretion are infantile cretinism, cachexia thyropriva (cachexia strumipriva) and myxedema.

These diseases are characterized chiefly by physical and mental inertia; decreased metabolism; abnormal sensations of taste, smell, and hearing; subnormal temperature; slow, weak pulse; changes in the skin (dryness, abnormal pigmentation), falling and blanching of the hair, and tendency to obesity. In the infantile type, physical and mental development are greatly retarded and unless the thyroid deficiency is supplied such children become dwarfed and idiotic. The metabolism is decreased more in thyroid diseases than in any other known condition.

In addition to the above clear-cut instances of diminished secretion of the thyroid, there are a number of conditions of hypothyroidism of less severe types. Certain cases of anemia, scurvy, mental disturbances; retarded growth in children; fatigue from slight exertion; tendency to obesity; swelling of the joints attended with feeling of stiffness, dryness of the skin with tendency of the nails to crack, and often associated with caries (decay) of the teeth; and migraine—all these have been correlated by various investigators with deficient secretion of the thyroid.

On the other hand, the four cardinal symptoms of "hyper" or too copious secretion are, enlargement of the thyroid, rapid heart action, nervousness, and exophthalmos (protrusion of the eye balls). These, with other secondary symptoms varying in character, constitute the symptom-complex of Graves' disease (exophthalmic goiter). The thyroid enlargement, while one of the constant symptoms, is not, as a rule, very marked. The cardiac and nervous symptoms as well as the exophthalmos vary with the degree of hyper-secretion. In advanced cases of exophthalmic goitre with marked toxemia, the nervous and cardiac disturbances are often extremely severe.

In the treatment of the three typical forms of thyroid insufficiency, the use of thyroid preparations has been attended with strikingly good results. The early administration of thyroid products in cretinism enables these children, who would otherwise be dwarfed and idiotic, to develop normally, both physically and mentally. The glandular material must, however, be administered over a period of many years, often during the entire lifetime of the patient. In cachexia thyropriva and myxedema, results of treatment are very much the same.

With the other conditions which have been more or less loosely

associated with thyroid hyposecretion (thyroid insufficiency) the results, as might be expected, have been more or less irregular. Thyroid therapy is not to be regarded as a panacea for all of the ills which have been described in connection with thyroid disturbances, but its intelligent application will often prove of great benefit in some of these more or less obscure types of thyroid inefficiency.

Obesity is frequently found in conjunction with those clinical conditions associated with decreased thyroid activity, and it is a well-known fact that thyroid preparations are capable of bringing about a rapid loss in weight. Indiscriminate use of thyroid for this purpose is to be condemned. If given at all, it should be used only in the most conservative manner and combined with proper hygienic and dietetic measures.

The serum or whole blood of animals from which the thyroid glands have been removed has been used with considerable success, in the treatment of Graves' disease (exophthalmic goiter). In exophthalmic goiter, we have an increased thyroid secretion and consequently a toxic condition manifesting itself chiefly by profound disturbances of the circulatory and nervous systems. The utilization of the blood from thyreoidectomized animals is based on the knowledge that there are normally present in the blood, substances which are neutralized by the thyroid secretion and which, in turn, are capable of neutralizing the thyroid substance. The removal of the thyroid gland permits an accumulation in the blood or of other body fluids of these substances having a specific neutralizing power for thyroid secretion and the subsequent administration either orally or hypodermatically of the blood or serum of animals treated in this way, affords a satisfactory means of controlling the thyroid toxemia.

EDITORIAL.

THE ADVANCEMENT OF PHARMACY IN MINNESOTA.

It is a matter of gratification to all those interested in the development of pharmacy to note the active interest displayed by the members of the Minnesota State Pharmaceutical Association in securing a prerequisite law. Mr. Ebert, the champion of the retail druggists, when he lived said that "the Laws to regulate the practice of pharmacy should protect the public, in whose interest they

are enacted and they should also in some way benefit the druggist." In those states where prerequisite laws have been enacted there has never been the slightest desire to repeal such legislation, for it has been found not only helpful to the pharmacists themselves, but of incalculable benefit to the public. All legislation which is not built on the bed rock of the necessity of prerequisite educational requirements, tends to the multiplication of drug stores and the demoralization of the practice of pharmacy. The failure to see this has been the chief cause in preventing the universal elevation of the apothecary in the United States and has caused the multiplication of evils connected with pharmacy. The time has gone by when any but the thoroughly educated applicant can be considered competent to own and conduct a drug store. It long has been known, as was expressed by Hallberg in 1893, that "the average young man with two or three years experience in four or five different drug stores, by investing a few dollars in quiz compends and watching the journals for the publication of questions, finds it a comparatively easy matter to pass a Board of Pharmacy Examination at the third or at the most the fifth time, that he applies."

The recent report issued by the Legislative Committee of the Minnesota State Pharmaceutical Association is of more than local interest. Three fourths of the active registered pharmacists of that state have voted on the question of having a prerequisite pharmaceutical education bill introduced in the coming session of the Minnesota Legislature, and approximately 80 per cent. of those voting favor the proposed measure.

The following table is of interest in showing how Minnesota pharmacists voted on the matter of introducing a Prerequisite Pharmaceutical Education Bill in the next session of the Minnesota Legislature (see page 40).

The problems of Minnesota pharmacists are similar to those which other pharmacists are giving much thought to at the present time. The sale of drugs and medicines by peddlers and other unqualified merchants, dispensing by physicians, the supply of competent drug clerks, the rapidly increasing number of drug stores, and the methods to be employed for training the future pharmacists are all questions which cannot possibly be satisfactorily adjusted until pharmacy is placed upon a sound professional basis.

These questions furthermore are public-health problems, for the practice of pharmacy stands next to the practice of medicine in

	<i>A</i> Total number Pharm.	<i>B</i> Total number voting	<i>C</i> Per cent. of <i>A</i> voting	<i>D</i> Voting yes	<i>E</i> Voting no	<i>F</i> Per cent. of <i>A</i> voting yes	<i>G</i> Per cent. of <i>A</i> voting no	<i>H</i> Per cent. of <i>B</i> voting yes
Minn. Regis. Pharm. act. engaged in Minneapolis	375	245	65.3	188	57	50.1+	15.2	76.7+
Minn. Regis. Pharm. act. engaged in St. Paul. . . .	218	131	60.0+	105	26	48.1+	11.9+	80.1+
Minn. Regis. Pharm. act. engaged in Duluth	66	36	54.5	29	7	43.9+	10.5+	80.5+
Minn. Regis. Pharm. act. engaged outside of above three cities.	881	652	74.0+	496	156	56.3	17.7	77. —
Total number of Minn. Regis. Pharm. act. en- gaged in the State. . . .	1,540	1,059	69.	814	245	53.	15.9	77.

NOTE:— 7 votes non-committal were received.

7 ballots were sent in marked "yes" but without signature.

1 ballot was sent in marked "no" but without signature.

12 ballots, all marked "yes," were received from M. S. Ph. A.
members outside of Minnesota.

145 ballots marked "yes" and 10 marked "no" were received after
the above table was compiled.

rendering pharmacological service to the public. The social and moral welfare of our communities is involved, for pharmacists by law hold the responsible duty of restricting to proper and legitimate uses narcotic and poisonous drugs.

Educational preparedness has brought forth success and prosperity in many fields of endeavor and it will do for pharmacy what it has done for other occupations. Of all the states in the Union, Minnesota stands to-day unexcelled in point of equipment and facilities for imparting pharmaceutical instruction. It is, therefore, not surprising that the pharmacists of the state have grasped the opportunity afforded them to secure that which will be of benefit to pharmacy and the public.

The professional drug business is constantly being demoralized by commercial influences, and not the least among these is the medicine peddler. These vendors with little knowledge of drugs and medicines are practicing pharmacy, and in some instances, medicine. State laws which to a degree restrict the practice of these professions to those best fitted by educational qualifications are therefore not infrequently nullified. Legislative bodies should increase the educational qualifications requested by pharmacists and by so doing provide professional pharmacists for the future who would unques-

tionably be best fitted to give that protection which the public has a right to demand.

Those who have made a careful study of the development of pharmacy and medicine in this country are not quick to condemn in inexcusable terms the practice of dispensing by physicians, or the sale of articles included in the so-called side lines of the pharmacist. These practices have arisen in most instances, no doubt, not from a matter of choice, but rather from necessity. The country, a few years ago, was being oversupplied with graduates in medicine. At the present time we have one physician for approximately every 700 persons. Before this time many physicians sought to increase their revenue from other sources than professional fees. Physicians could not well engage in the sale of miscellaneous merchandise, but they could sell drugs, and the result was dispensing physicians. Fortunately for medicine, and the public as well, the annual number of graduates from our medical schools is now less than half of what it was a few years ago. This change has been brought about by increasing educational requirements, the only manner in which such control can be regulated under our system of government.

The public needs not more physicians, but better physicians, and likewise in pharmacy the real need is not for a larger number of pharmacists, but rather for better pharmacists. Such conditions can obtain only when the number of pharmacists is not in great excess of the professional service demanded, as at present.

The profession of pharmacy is gradually going through an evolution similar to that through which medicine has passed. Higher educational requirements for pharmacists will in time reduce the number of drug stores to a point more nearly in accord with the pharmaceutical requirements of the public. Pharmacists and the general public are rapidly coming to appreciate the importance of legislation along these lines, and prerequisite bills will be introduced in the legislatures of the following states this month: Indiana, New Jersey, North Carolina, South Carolina, Tennessee, Colorado, Michigan, Montana, Iowa, Virginia, Louisiana, Illinois, West Virginia and Minnesota.

When standards commensurate with the profession are established, pharmacy will develop professionally. The public demands professional pharmaceutical service and pharmacy should therefore be maintained under such conditions that the public may receive the best expert service.

The interest of the public in the development of professional pharmacy was well expressed by the late Gov. Winfield S. Hammond who stated (*AMER. JOUR. PHARM.*, 1915, p. 142), "It would be unfortunate if this old-time honorable profession should become merely business. . . . We would not want our lawyers, our doctors, our apothecaries, our clergymen to be distinguished principally as mere business men. We like to have them remain in the realm of professionalism, and be as great and as useful in professional work as others are in the business field. . . ."

"We are all interested in legislation tending to restrict the use of noxious drugs. Here is a line of endeavor that, of course, should be absolutely divorced from the business end of the work. Here is a question that appeals to you as professional men and as men who desire to adapt your profession to the best interests of your brothers and your sisters, and any attempt, I fear, to connect this kind of legislation with the business end of the pharmacist's occupation and profession would tend to detract from the high professional standing that the apothecary has always had and that the modern pharmacist should endeavor to maintain."

BOOK REVIEWS.

A TREATISE ON PHARMACY FOR STUDENTS AND PHARMACISTS, by Charles Caspari, Jr. Fifth Edition, Enlarged and Revised. Illustrated with 337 engravings. Publishers, Lea and Febiger, Philadelphia and New York.

This textbook for students of pharmacy is intended as a compendium to the United States Pharmacopœia and the National Formulary. The recent revision of these two legal authorities for drug standards and formulas necessitated the fifth edition of this publication to bring it up to date and in order that its statements may conform to the official requirements.

From the viewpoint of the book maker, the book is excellent; paper and binding both good, type clear, and the illustrations, judicious selections, well serving their purpose. The typographical errors are few indeed: unfortunately, the typesetter had to bungle "official formulas" on the first page of the preface.

The subject matter is divided into three parts. Part I is called General Pharmacy and treats of the pharmacopœias and what could

be termed the Physics of Pharmacy. Part II is named Practical Pharmacy and this could with propriety be denominated Galenical Pharmacy. Part III is a concise treatment of Pharmaceutical Chemistry.

Chapter I is a succinct account of the intent, history and plan of the United States Pharmacopœia. In subsequent chapters of Part I the subjects of weights and measures, specific gravity, heat, subdivision of drugs, solution, etc., are presented. The chemical and physical principles underlying the process of solution are set forth and the subject of "Colloidal Solutions" is clearly explained in a paragraph devoted to this interesting phenomenon.

One notes that throughout the book the word "mil" is always followed by "(or Cc.)." The publicity already given to the adoption of the word "mil" by both the U. S. Pharmacopœia and the National Formulary should have obviated the necessity for anything more than an explanatory statement and this monotonous tautology could have been omitted.

The subject of Sterilization is considered in "Chapter VII. Solution" and again in "Chapter IX. Separation of Non-Volatile Matter." Sterilization and pasteurization are of sufficient importance to merit treatment in a separate chapter as distinct processes and more especially since the Pharmacopœia and National Formulary have set such an example which can be followed by works on pharmacy.

In a short chapter "Crystallization" is admirably presented to the extent of the needs of the pharmacist.

Under the classification of the products used in pharmacy, we note that in the treatment of "Fats," the various official fixed oils and fats are enumerated and in a separate paragraph each is described, and then in a chapter in Part III. Pharmaceutical Chemistry, much of this is repeated.

There are a few statements in the book to which one may take exception. The pharmacist will object to considering the official Compound Solution of Cresol as an emulsion (p. 369). Botany requires exact adherence to its scientific terms and definitions. The statement on page 108, "only the inner bark being employed, the outer *epidermis* should be removed," is subject to the criticism that the writer evidently uses "epidermis" when he intends the outer layers. In the official barks the outer portion removed is much more than the epidermis and not infrequently includes the cork and

even the primary cortex. Another inaccuracy is noted on page 363, where lycopodium is in the following quoted sentence twice referred to as a *seed*: "In making emulsion of lycopodium, it becomes necessary to triturate the *seed* dry, with some pressure, in order to rupture the hard *seed* envelope."

The tendency among the modern authors on pharmacy is to differentiate more clearly and sharply between the various classes of medicinal preparations. In this book the differentiation has not been as clearly drawn and distinct as could reasonably have been expected. An example of this is seen in the consideration of "Ampuls" in the chapter entitled "Compressed Tablets and Tablet Triturates." The method of preparation of ampules and the finished products bear no relation or similarity to tablets and their manufacture. Moreover, the extensive use of ampules for exhibiting all forms of medicine warrants a separate chapter devoted to that subject. Similarly, we note that in the chapter on "Pills" there is introduced in the discussion of pill making and coating a description of the methods and machinery employed in manufacturing soft elastic capsules and gelatin globules or pearls for encapsulating liquids. Would it not have been a better classification to have treated Suppositories in the chapter devoted to "Ointments, Cerates and Allied Preparations" rather than with Plasters? Possibly the importance of Suppositories as a distinct dosage form should have necessitated a separate chapter on that subject.

The various classes of official preparations are, as a rule, commendably treated and the tabulations commonly used for their presentation, while concise, are clear expositions. The chapter on Syrups is an excellent example of such tabulation.

"The Prescription" is very quickly dispensed in a chapter of less than fourteen pages, of which three pages are devoted to sample prescriptions and three pages to abbreviations and terms used in prescription writing. The subject of incompatibility, so closely related to the pharmacists' important duty of compounding prescriptions, is treated in a prior chapter on "Mixtures," which is largely devoted to the consideration of the official mixtures.

There is much to commend in this volume and comparatively little of importance to criticize adversely. The defects pointed out are, after all, only minor ones that can be readily corrected in a future edition and will detract very little from its serviceableness as

a textbook. The very conciseness and clarity of the author's expounding of the formulas and requirements of the U. S. P. and N. F. accrue to the value of the volume and make it more useful as a textbook for pharmaceutical students. Doubtless, it will well serve the purpose of the author as "a guide to the intelligent study of these two national authorities."

G. M. B.

LESSONS IN PHARMACEUTICAL LATIN AND PRESCRIPTION WRITING AND INTERPRETATION, by Harry G. Muldoon, Ph.G., Instructor in Latin, Massachusetts College of Pharmacy. Published by John Wiley & Sons.

This little volume is intended for medical and for pharmacy students. So in addition to the customary lessons in Latin declensions and inflections, there is presented also information on prescription writing not only from the standpoint of Latin, but also involving the Metric System and the Harrison Antinarcotic Act. Special emphasis is placed on interpretation of Latin titles and of abbreviations, pronunciation of Latin being deemed of lesser importance.

"Neither drug store experience nor previous knowledge of Latin is assumed."

WILBERT MEMORIAL MEETING.

Forty-one representatives of various branches of the pharmaceutical and medical professions gathered in the Philadelphia College of Pharmacy on Thursday afternoon, December 7, 1916, at two forty-five P.M. to do honor to the memory of Martin Inventius Wilbert, who passed away on Saturday morning, November 25. Twenty-seven organizations of the chemical, pharmaceutical and medical professions were represented and Mr. Howard B. French, President of the Philadelphia College of Pharmacy, was unanimously chosen to preside at the meeting. Owing to pressure of other engagements, Mr. French relinquished the chair to Mr. George M. Beringer when the meeting was about half over. Robert P. Fischelis was unanimously chosen to act as secretary of the meeting. The following bodies were represented:

New York Branch of American Pharmaceutical Association,
New York College of Pharmacy,
Baltimore Branch of American Pharmaceutical Association,
Maryland College of Pharmacy,
New Jersey Pharmaceutical Association,
American Pharmaceutical Association,
American Chemical Society,
American Therapeutic Society,
American Academy of Medicine,
American Medical Association,
Pennsylvania Medical Society,
Pennsylvania Pharmaceutical Association,
Pennsylvania Society for Prevention of Tuberculosis,
United States Pharmacopœial Revision Committee,
National Formulary Revision Committee,
Council on Pharmacy and Chemistry of the American Medical Association,
Pennsylvania Board of Pharmacy,
College of Physicians of Philadelphia,
Philadelphia College of Pharmacy,
Philadelphia Branch of American Pharmaceutical Association,
German Hospital,
Philadelphia Association of Retail Druggists,
Philadelphia Drug Exchange,
Philadelphia County Medical Society,
Philadelphia Pediatric Society,
Child Federation of Philadelphia,
Philadelphia Medical Club.

While the secretary made note of the representatives present, Chairman French read communications from the following:

Dr. H. V. Arny, New York City,
Dr. John B. Deaver, Philadelphia,
Mr. John F. Hancock of Baltimore,
Mr. S. L. Hilton of Washington, D. C.,
Mr. Joseph L. Lemberger, Lebanon, Pa.,
Mr. David J. Reese, Philadelphia, Pa.,
Dr. I. V. S. Stanislaus of Lock Haven, Pa.

Professor Remington moved that a committee be appointed, which would as far as possible represent the associations taking part in the meeting, to draw up suitable resolutions, have them engrossed and sent to Mrs. Wilbert. The motion was seconded by Dr. F. E. Stewart, and carried. Professor Kraemer moved that a copy of these resolutions be also sent to Dr. Wilbert's parents. This motion was seconded by Mr. Thum and carried.

President French then declared the meeting open for comments on the life and activities of the departed. Professor Remington in a few well-chosen words related the circumstances connected with Dr. Wilbert's death and gave a general outline of his career in pharmacy. Dr. F. E. Stewart endorsed the sentiments expressed by Professor Remington and pointed out what a loss had come to professional pharmacy by the death of Dr. Wilbert. Mr. H. E. Smith, vice-president of the German Hospital, spoke of Dr. Wilbert's connection with that institution, lauding his work very highly. Professor E. G. Eberle read a beautiful tribute summing up the activities of Dr. Wilbert during his lifetime and referring to his influence upon modern pharmaceutical and medical thought. Dr. H. P. Hynson feelingly expressed his sense of loss through Dr. Wilbert's death, as he had been an intimate friend of the deceased for many years and shared his views on the pharmaceutical problems of the day. He urged that Wilbert's life and works be made a subject of careful study by the coming generation of pharmacists, as great good would surely come of his work if it be carried on to its ultimate conclusion. Professor Hostmann also expressed the view that Wilbert's influence on the younger men in pharmacy would be a profound one. Dr. J. W. Sturmer spoke of Dr. Wilbert's activities in the Philadelphia Branch of the American Pharmaceutical Association which he helped to organize, and said that the many printed pages in our pharmaceutical publications were monuments to Wilbert's career. His work has ceased but his influence will go on indefinitely. Professor C. H. LaWall referred to Dr. Wilbert's work as a member of the National Formulary Revision Committee and as the author of "Digest of Comments on the Pharmacopœia and National Formulary." Professor Henry Kraemer read a letter from one of Dr. Wilbert's sisters in which Dr. Wilbert's early history was portrayed. Dr. William D. Robinson, who had worked with Dr. Wilbert at the German Hospital, commented upon his scientific attainments, especially in the operation and development of the X-ray. He stated that Dr. Wilbert had been of incalculable value to the medical profession and had been ready and willing at all times to assist physicians in their work.

Other speakers were Drs. P. Samuel Stout, A. T. Pollard, Charles L. Turnbull and Franklin M. Apple.

Mr. George M. Beringer concluded the remarks with a reference to the magnitude of Wilbert's work and then appointed the following Committee on Resolutions: Chairman, Joseph P. Remington, W. D. Robinson, Henry Kraemer, E. G. Eberle, R. P. Fischelis.

ROBERT P. FISCHELIS,

Secretary.

CURRENT LITERATURE.

CONFERENCE ON MEDICINAL HERB GROWING

A Conference of Herb Growing Associations and of others interested in this new industry was held September 27 in London under the auspices of the Central Committee for National Patriotic Organisations, which has been strenuously endeavouring to place the industry on a sound footing.

The following resolutions were carried unanimously:

"1. That it is the opinion of this Conference that none of the existing organisations as at present constituted in connection with the growing and collection of medicinal herbs meets the needs of the industry from a national point of view, that these needs can only be met by the establishment of definite relations on organised lines between the organised and unorganised herb-growers of the country, the objects of which shall include the

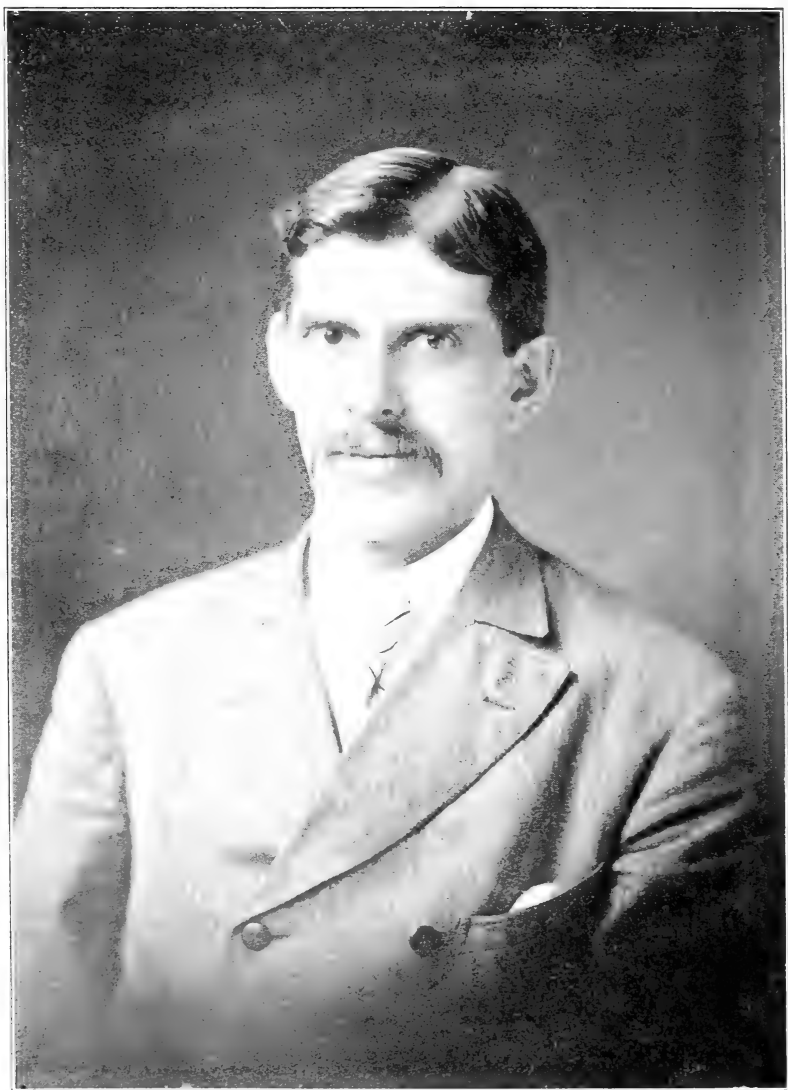
"(a) Interchange of information and suggestions and the production and distribution of suitable literature and the organisation of propaganda.

"(b) Investigating of the requirements of central, local, and other markets, and regulating prices.

"(c) Regulating of the production, collection, treatment, output and delivery of herbs to meet the needs of the various markets.

"(d) The furnishing of the necessary funds to accomplish these objects.

"2. That the consideration of how best to establish such relations and carry out the aforementioned objects be referred to a special committee, not exceeding twenty-one in number." On this committee were to be representatives of the various herb-growing associations of Scotland, Ireland and England.



MARTIN INVENTIUS WILBERT, 1865-1916.

THE AMERICAN JOURNAL OF PHARMACY

FEBRUARY, 1917

MARTIN I. WILBERT, PH.M., PH.D.

BY JOHN K. THUM, PH.G.,

PHARMACIST AT THE GERMAN HOSPITAL, PHILADELPHIA, PA.



Martin Inventius Wilbert was born at West Leyden, Lewis County, N. Y., June the first, 1865. He was born of German parents, the second child in a large family. At the age of four years and two months his education was begun in a nearby country school. Subsequently he attended a private school in Utica, where he gave particular attention to the study of the language of his forbears, and later on attended Archambault's Academy in the city of Montreal.

His family on both the paternal and maternal side came to this country in 1852, his father having been born in Prussia and his mother in southern Germany. Their people were pioneers in what is now known as the Adirondack Preserve of New York State, clearing out their land and building homes of logs, which, as progress manifested itself, were followed by frame buildings.

Dr. Wilbert had the advantage of being brought up under an environment and home training whose influence manifestly shaped his whole career. His father had been educated in the German schools of north Germany, and as these schools are noted for their thoroughness and the strict discipline with which they are conducted, the studious habits and sense of discipline which he acquired naturally influenced and guided him in the training of his son. Those of us here in Philadelphia who were associated with Dr. Wilbert in his work, and in a position to observe his whole career, can readily testify to the thoroughness with which he did his work; no detail of it ever escaped his watchful eyes.

Of all the mental faculties that man can be blessed with, un-

doubtedly, that of a retentive memory, properly trained and cultivated, is of most use to him in the development of his intellect. Our friend had this in a most amazing degree, a memory that can only be described as tenacious, and this was supplemented with the gift or power of concentration. Some people say that the former is naturally the result of the latter, but a closer examination of this question will reveal that while concentration of the mind is conducive to the development of the memory cells, it does not altogether explain the wonderful examples we sometimes come in contact with, of retention by the mind of things seen or read, and which are always available for use by the fortunate owner at a second's notice. Both his father and mother are noted in the family for their remarkable memory power and their son inherited this faculty in generous proportions. And, as memory is the purveyor of reason, here we have the answer in this case as to why this man had such a particularly fine type of mind.

Besides being the possessor of this extraordinary memory he had remarkably keen power of observation. His mother has always been exceedingly fond of plants and nothing delighted her more than to have time for cultivating them and watching them grow, and her son Martin took after her very much in this respect. Plant life always had a strong fascination for him; nothing would please him more than an opportunity for a ramble in the fields and woods and the chance to study the plants in their natural environment. In this love of nature one unconsciously broadens in many directions, acquires a keenness of observation that becomes second nature, and develops the scientific mind. And Wilbert had this in a large measure.

After some time spent in the employ of a drug store in the city of Utica, he was impressed with the need for a broader field, more systematic training, and education along pharmaceutical lines, such as a recognized college of pharmacy could give. Accordingly, he came to Philadelphia and matriculated at the Philadelphia College of Pharmacy, from which he graduated with honor in 1890. He owned and conducted a retail store in Philadelphia for a very short time, and in 1891 he was appointed apothecary to the German Hospital, Philadelphia. At this splendid institution, built upon efficiency and devoted to service, he soon impressed the authorities with the fact that he was a man of ability and promise. In fact, he always impressed most people that he came in contact with as an unusual

man. I met him for the first time when I was about sixteen years of age and was quite impressed with the great fund of information that he possessed and the kindly manner in which he would place it at the disposal of whoever might be in need of some of it. Indeed, I have never met a man who was so willing to help others. And he possessed in a great degree the virtue of patience, almost unlimited patience!

Dr. Wilbert proved himself to be a most valuable addition to the hospital in many ways. He possessed the faculty of criticism in a large degree but, unlike most criticism, it was of a constructive nature; what he tore down he replaced with a better structure. He never seemed to be at a loss for ideas. In fact, he was that most useful of men, the man with ideas! There is always room in the world for such a type of man, and especially so in a modern hospital.

Just previous to his departure for Philadelphia to further his studies in pharmacy, amateur photography became very much the fashion and, with his usual avidity for knowledge, he provided himself with a camera and the necessary books on this absorbingly interesting subject. To one of his studious nature and research mind, the fundamental principles of this delightful science and art were soon mastered. Unlike many amateurs he performed every detail of the work necessary to obtaining the final picture. Every phase of the work was to him a great delight; from the ramble in the fields or woods in order to get some interesting bit of landscape or other view of glorious nature to the developing and printing of the exposures he made.

This proficiency in photography which he acquired stood him in good stead in after years at the hospital. He became one of the pioneers in the use of the X-ray in this country. It was very shortly after Roentgen had announced to the world his epoch-making discovery, that the German Hospital began giving its patients the benefit of this additional aid in diagnosis and treatment.

Dr. Wilbert himself made the first X-ray machine used in this institution and operated it himself with great success for some time. We still have it here, but only as an interesting relic. It would now be regarded as a very crude affair compared to the magnificent modern plant in use at the German Hospital at the present time.

Naturally, to a man of his exceptional ability and all-consuming acquisitiveness for knowledge, work of this kind was most congenial and interesting. In recognition of his work along this line, and

firmly convinced that this science would become a requisite for a modern hospital, the board of trustees of the German Hospital created a department of Roentgenology, and elected him the director thereof. He still, however, retained his position of chief apothecary. Besides being one of the pioneers in this work in this country he was also a frequent contributor to the literature that this wonderful science has evolved.

Strangely enough, while many of the pioneer workers were affected by constant exposure to this phenomenon of electricity, and some even lost their lives therefrom, Dr. Wilbert himself never seemed to have developed those insidious burns from which nearly all the early workers subsequently suffered. While some of these early workers scoffed at any possibility of danger, he was always careful to so conduct his work as to reduce personal exposure to a minimum. His common sense, which he had a good share of, is best illustrated by the reasons he gave for his carefulness in not permitting himself to be subjected to any unnecessary exposure. He said: "If this phenomenon of electricity is so very potent for good, it may in an equal measure be potent for extreme harm." Our present positive knowledge on this subject proves him to have been right.

It would be impossible within the brief scope of this memoir to go very deeply into his career as apothecary at the hospital. When the beautiful and imposing front had been added to the hospital in 1894, he was given permission to arrange and thoroughly equip a complete hospital pharmacy. To this day the German Hospital pharmacy is ample testimony to the capable and thorough manner in which he carried out this mission. From the day he came here, and, we are happy to say, to the present time, pharmacy has been practiced as the leaders with ideals in American pharmacy have always wished it to be practiced. Dr. Wilbert always held that the tendency of the average pharmacist to be satisfied to be a mere dispenser was a very regrettable one and if not checked would indefinitely postpone the day when pharmacy would be generally regarded as a profession.

He always held the opinion that the pharmacist was morally responsible for all medicines dispensed. He continued to hold to this to the end. It was a principle that he always fought valiantly for, and in return he was subjected to return fire from others who sometimes neglected to fight like gentlemen. However, those who

fight for a principle must be prepared for this, and, as Wilbert was a philosopher, he accepted the abuse and scurrility that was sometimes handed out to him with that spirit that only a great character always exhibits.

At the German Hospital pharmacy he adopted at once the policy of buying the crude drugs and chemicals from reliable sources and carefully testing them to see that they came up to official requirements. When they failed to meet the standards they were returned with a courteous note explaining the reasons therefor. He was a great believer in doing an unpleasant thing in a pleasant way. In other words he was always a gentleman. When the tested drugs and chemicals came up to the requirements, and not before, they were then manufactured into the various pharmaceutical preparations and dosage forms. This policy of manufacturing our own preparations was of inestimable benefit to both our patients and doctors, as the latter were always sure that medicines were true to label, and that their patients were getting just what they wanted them to get.

Everything in the pharmaceutical line was made, fluidextracts, effervescent salts, elixirs, emulsions, glycerites, infusions, liniments, collodion, ointments, suppositories, medicated waters, syrups, tinctures, troches, spirits, solutions, and mixtures of all kinds, hypodermatic tablets, and many thousands of compressed tablets in the course of a year. All this meant work and plenty of it, but it was pharmacy and was in the interests of economy. As the hospital, like all charitable institutions, has the privilege of tax-free alcohol, it was a distinct asset for it to have in its employ a man who was a real pharmacist and who was willing to work at it. And our dear friend was all of that; and not only that, but he had the happy faculty of inspiring his associates to the same desire for work and usefulness.

It was due to his initiative that the hospital has its own apparatus for making carbonated waters. Some years as many as over ten thousand bottles of these are filled. An automatic water still is also one of our useful possessions and the idea is one of the many good ones from his fertile brain.

Dr. Wilbert always had a horror for secrecy in the manufacture and sale of medicines, and while it may be admitted that many proprietaries do not come within this category, yet he could not altogether reconcile himself to even these, he contending that as the

patients generally paid many times what they would have to pay for a prescription of useful pharmacopœial drugs, it was not altogether honest. For a prescription to be presented to him calling for one or more proprietary medicines was like gall and wormwood to him. He felt so strongly and earnestly on this matter that the board of trustees, at his request, adopted the following resolution: "No prescription containing in all, or in part, a proprietary medicine shall be compounded or dispensed at the pharmacy of the hospital, unless the prescription shall be personally signed by a chief of the house, or a chief of the dispensary, or by the medical superintendent."

We doubt if there is another hospital in the country where the doctors confine themselves so closely to the prescribing of the really useful drugs known to science; where the administration of medicines is carried out in so rational and intelligent a manner. Our internes are cautioned against gullibility, and taught the advantages of exhibiting an intelligent and honest skepticism in regard to the newer remedies. We are fair to everybody when we assert that this policy was largely due to Dr. Wilbert's influence.

One of the most useful things that Dr. Wilbert did for pharmacy in this city was the initiative that he took in the organization of the Philadelphia Branch of the American Pharmaceutical Association. His activity in this matter was really the beginning of his development as the most marked power and personality in the profession of pharmacy to-day, and helped to develop him as *the* one who really and actually was the connecting link between the two professions of medicine and pharmacy. There was not a little diffidence among some of the leaders of pharmacy in this good old City of Brotherly Love at that time as to the advisability of starting, and the necessity for such, an organization. But behind our friend's genial disposition there was an indomitable will, and by the exercise of tact and diplomacy he aroused an enthusiasm that was almost equivalent to his own and the Branch was organized at once, with everybody wondering why, in the birthplace of pharmacy in this country, Philadelphians had not seen to it that the organization of the first branch should take effect in this typically American city, where nearly all the great movements in medicine and pharmacy had their inception.

The members of the newly-organized branch, in casting about for a secretary, for after all is said, the live wire in any organization is, or should be, the secretary, immediately recognized the fact that Dr. Wilbert was admirably fitted for this office and the

logical man for the position. He was repeatedly reëlected to this position and held it up to the time that he went to Washington.

Few could resist his infectious leadership and everyone of the membership put their shoulders to the wheel and strived to put pharmacy on a higher and better plane. I am sure that many of the thinking men in medicine and pharmacy in this city will agree with me when I say that his whole influence was directed to bringing about better relations between the physicians and pharmacists, not only in this City, but in the whole State, and he to a very large extent succeeded.

But Dr. Wilbert always held that such improved relationship could not be brought about and held, without a realization on the part of pharmacists of their shortcomings and an honest endeavor on their part to overcome them. He always freely acknowledged that there were many pharmacists who were of a high-water mark, but he always insisted, with fearless emphasis, that it was the duty of the more intelligent and better type of men in pharmacy, not to be merely content with the example they set to the rank and file of pharmacy, but to organize, point the way, and lead it to better things.

Bodies of men, if they would accomplish the fullest measure of their usefulness, must have, like individuals, an ideal and strive to attain it. There could be no civilization otherwise. In proportion as the nation has this spirit, just in such measure will it be able to render real service to itself and to the rest of mankind. Dr. Wilbert had ideals and I believe he came as near to living up to them as any man ever did. Moreover, he sincerely believed it was his bounden duty to make others see the light as he saw it.

Unlike many men with ideals he was of a most practical turn of mind. This was very forcibly impressed on many when he suggested, immediately after the Philadelphia Branch of the Pharmaceutical Association was organized, that a systematic attempt be made to bring before physicians the desirability of prescribing the really useful drugs and preparations of the United States Pharmacopœia and National Formulary in preference to the many undesirable proprietaries on the market. He advocated that the pharmacist equip himself in every way so that he could advise his medical clientele in an intelligent manner when he made his plea for their support; to fit himself so that his argument, that it was advantageous to both patient and physician, that the latter know something of drugs

and give a closer adherence to official drugs and preparations, would carry conviction.

I believe it was in 1907 that the American Medical Association met in Atlantic City for the first time. The Philadelphia Branch of the American Pharmaceutical Association was invited to give a scientific exhibition of pharmacy. Under Dr. Wilbert's inspiring enthusiasm an exhibition of the really useful preparations of the United States Pharmacopœia and National Formulary was given that aroused the interest of physicians all over the country and caused considerable favorable comment in both branches of medicine. The value of this idea was at once discerned by the other branches throughout the country and used to great effect in stimulating interest, or rather, renewed interest in official drugs and preparations.

But, as he pointed out, the Branch could not afford to stop at this point. It was but the beginning and must go on, if a proper harvest were to be realized. From that time on Dr. Wilbert worked unceasingly, sending the exhibition to the Philadelphia County Medical Society and its various branches, and lecturing earnestly for the cause of what was to the best interests of the pharmacist. The well-informed pharmacist can never forget his self-sacrificing interest in his behalf. He was quick to see that if this work was to be permanent and of lasting good the medical and pharmaceutical professions must work together and safeguard the interests of their patients.

This exhibition was afterward sent to various parts of the State of Pennsylvania and undoubtedly was of tremendous influence in developing the propaganda movement, not only in this state, but throughout the country.

At the meeting of the American Medical Association at Atlantic City, June, 1909, the Philadelphia Branch of the A. Ph. A., at Dr. Wilbert's suggestion, who was then located in Washington, gave another scientific exhibition of pharmacy and things related thereto. This exhibition was undertaken in a more elaborate manner and received support from members of the parent organization from Maryland, New Jersey, New York, Pennsylvania, and Washington, D. C. As the writer was a member of the committee who had the matter in charge, and its Secretary-Treasurer, he is in a position to speak of the valuable assistance he received from this valiant champion of a profession of pharmacy. Nothing was ever too much for him. He was always helpful with advice, full of ideas and most un-

selfish in rendering practical assistance to carry them out. I will never forget how, on the pier at Atlantic City, when I found it impossible to get the services of a carpenter, Dr. Wilbert took off his coat and hat, collar and tie, and handling a saw and hammer like one born to it, erected the stand on which we arranged our exhibit. As we had been friends for twenty-six years and for a period of eleven years I had been his assistant at the German Hospital, I feel that I am in a position to say that it was typical of the man. He was essentially a worker and absolutely honest. There was nothing of the poser about him. And thanks to his whole-souled assistance and self-sacrifice, the American Medical Association conferred on the Philadelphia Branch of the American Pharmaceutical Association a certificate of honor for this splendid exhibition.

On October the first, 1908, Dr. Wilbert left the German Hospital, which, in a measure, was his home, to accept a position in the federal government, as assistant in the Division of Pharmacology of the Hygienic Laboratory, United States Public Health Service.

The severing of his relations with the "dear old German," as those who love the institution so fondly refer to it, was to him one of the saddest moments of his life. He had formed associations and friendships here which were very dear to a man of his largeness of heart, and we on our part must acknowledge that he had entered very deeply into our affections.

Dr. Wilbert was a well-read, many-sided man who took a deep interest in affairs and was particularly active in the advancement and betterment of his profession. He believed with his whole heart that man was put here by the Almighty to be of service to humanity, and to that end he gave himself gladly and unreservedly to many activities. Many of the members of the many scientific societies that he was a member of can testify to this! He was active in the affairs of the Franklin Institute, the American Pharmaceutical Association, the American Roentgen Ray Society, and the American Medical Association. He was a member of the Committee on Revision of the United States Pharmacopœia, the Committee on Revision of the National Formulary, the Committee on Recipe Book of the A. Ph. A., and a member of the Philadelphia College of Pharmacy. For many years he had been a member of the Publication Committee of the AMERICAN JOURNAL OF PHARMACY, published by the College. He contributed many articles to this journal, the oldest and best in this country. To attempt to enumerate and mention all

the articles appearing in this journal from his prolific pen would take much space. It will suffice to say that one can hardly pick up a number appearing in the last fifteen years without coming across a paper by him.

Martin I. Wilbert was regarded by all who knew him intimately as a particularly fine type of man. He never made any special effort to gain any one's good opinion or respect, he was just himself all the time. His wide knowledge, kindliness, and good common sense, which was recognized by everybody here, and which he had in large measure, commanded respect and admiration from all who came in contact with him, either in a business or social manner. He was never ostentatious in any of his actions or words. He was tolerant, modest, and unassuming and always charitable in his judgments of others. Can any one have any finer characteristics than these? His many friends and associates at the German Hospital felt his departure keenly and to the day of his death took a keen interest in all he did in his new sphere of activity. And of the hospital, he always spoke of it as "home." And in the home that he loved so well and among friends of many years, it was vouchsafed him to pass into the great beyond.

As the *Journal of the American Medical Association* rightly says, "the full measure of his influence at Washington in behalf of the public health will never be fully known." He was most active in helping along the passage of the Harrison Narcotic Law, and a valuable counselor to the National Drug Trade Conference, the representative body whose efforts resulted in the law as it now stands.

By his work in connection with the Digest of Comments on the United States Pharmacopœia and the National Formulary he has built a monument that will endure for a long time. This really very necessary adjunct to the revision of a pharmacopœia was inaugurated by Dr. Charles Rice, who was one of the first to point out the real necessity of a compilation of the criticisms on the pharmacopœia and the substances that enter into it. Only by some such method would it be possible to publish a book that would be representative of the time. The request of the board of trustees of the United States Pharmacopœial Convention to the surgeon-general of the U. S. Public Health Service, for assistance and coöperation in the compilation and publication of a "Digest of Comments" not only gave to this work the backing and resources of the federal government, but likewise brought to the task the assistance of the one man in this

country best qualified to do it from every standpoint, that portion of this monumental work referring to foreign pharmacopœias being particularly well done. Indeed, Dr. Wilbert's knowledge of foreign pharmacopœias was very comprehensive. It is doubtful if there is another man in this country who possessed such a wide and varied knowledge on this subject as he did.

He was always willing and ready to start something that might be for the general good and make for progress. He had hardly become settled in Washington before he saw the need for the organization of a local branch of the American Pharmaceutical Association in that city. To see the need was for him to act. He possessed more initiative than a dozen ordinary men despite the fact that his health was never very robust. From childhood his health had never been rugged. Yet in spite of this handicap he was always undaunted; no amount of work ever fazed him. He was a most tremendous worker. If, as Carlyle says, "genius is a capacity for hard work," then Dr. Wilbert was most certainly a genius. He was never idle for a moment. The Branch in Washington was promptly gotten under way and he was made secretary. Under the stimulus of his remarkable energy this branch has done work that the parent organization need never be ashamed of.

I believe it was in 1902 that he became a member of the American Pharmaceutical Association. From the very beginning of his membership he became very active. He was full of enthusiasm over this new outlet for his energy and activity. He never attended a meeting without having one or more papers to read. A perusal of past proceedings shows that in debate and discussion he made himself a power to be reckoned with. His wide range of information and the thoroughness with which he accomplished every task that was set before him was appreciated by all. In committee work he was an exceedingly able worker and counselor. When the Commission on Proprietary Medicines was formed it was immediately appreciated when Dr. Wilbert's name appeared among those appointed, that the most logical choice had been made. His unquestioned fitness for this work was undoubtedly of transcendent value to the A. Ph. A. because of the rich experience he obtained as a member of the Council on Pharmacy and Chemistry of the American Medical Association. As an instance of how one opportunity leads to another, I may say that when the sentiment of the Association for some method of formulating Standards of Unofficial Drugs had crys-

tallized itself into the formation of a Committee of Unofficial Standards for this specific purpose, Dr. Wilbert's qualifications and special fitness for a place on this important committee were not overlooked. Whenever and wherever there was work to be done, there you found Dr. Wilbert. Always in the forefront, ready and willing for service.

The constructive work that he has done as a member of the American Pharmaceutical Association will perhaps never be surpassed. He was an original thinker, and, as previously mentioned, brimful of ideas! And his ideas, combined with the suggestions of others and the willing coöperation on his part with others to carry them out for the general good, were ever at the service of this association, whose history is the history of American pharmacy.

Dr. Wilbert was a voluminous writer on pharmaceutical and pharmacological subjects. His literary output was notable not only for its quantity and clearness of style, but likewise for its originality and high order of thought. The great diversity of thought and topics touched upon by him clearly reveal his wonderful versatility. He touched upon many subjects connected and allied with pharmacy and handled them all with that thoroughness and attention to detail that he was noted for. The efforts of the early leaders to develop pharmacy, and place it on the same plane with the other learned professions, were ever in his thoughts, and he endeavored always, with voice and with pen, to carry forward the work to the end for which they had so earnestly labored in the past. He was a most earnest worker in the cause for better and brighter things in pharmacy, and I am sure that I voice the thoughts of many when I say that he has left an impression not only on pharmacy, but likewise on certain medical interests, that will endure for a long time. To the younger men in pharmacy his name will ever be an inspiration and his life an illustration as to what industry and perseverance can lead to.

In the field of medicine his name shines most brightly as one of the ablest workers on the Council on Pharmacy and Chemistry of the American Medical Association. He was one of the organizers of this Council whose aims are the development of a more rational therapeutics; to offer some measure of protection to the medical profession and the public against the fraudulent advertising of proprietary medicinal articles; and to develop a propaganda against the spread of quackery and harmful self-medication and indulgence by the laity in nostrums. To this end he performed a tremendous

amount of labor. The well-informed can never forget his work in this connection. With Dr. R. A. Hatcher, he was a collaborator in the writing of a most useful volume called "The Pharmacopœia and The Physician." The fact that this volume is now in the third edition is sufficient affirmation of its usefulness to the medical profession. And in the pages of the *Journal of the American Medical Association* he frequently gave expression to thoughts of paramount interest to physicians. It is no exaggeration to say that the medical profession owes much to him and his unselfish efforts.

He graduated with honor from the Philadelphia College of Pharmacy in 1890 and in 1903 he received from his alma mater the degree of *Master of Pharmacy in Course*. From the Medico-Chirurgical College of Pharmacy and from the Georgetown University he received the degree of *Doctor of Pharmacy*, in recognition of his able work in behalf of his chosen profession.

He is survived by his wife, father and mother, and five sisters. Requiescat in pace.

BIOLOGICAL STANDARDIZATION.

BY HERBERT C. HAMILTON.

Under this heading Rusby (1) reviews the U. S. P. methods for standardizing the drug and glandular extracts which admit of no exact chemical assay. He asserts that from the viewpoint of the medical profession any favorable opinion regarding these methods was almost entirely because of "confidence in those who recommended them." But that even "this confidence was considerably weakened because of radical differences which existed among those authorities." The parallelism between therapeutic value and the measured physiological effect was also questioned. "On the other hand the convention had the greatest confidence in the specialists who were in charge of these investigations."

The review while entirely impartial is lacking in one important feature, it fails to give the viewpoint of the manufacturer just as the revision committee failed to give it due consideration. The importance of this feature is in the fact that the manufacturers were in many instances the originators of the tests in use, and had of necessity developed them from scientifically interesting facts to

a practical working basis. These manufacturers through years of experience were in a position to eliminate the nonessentials and to arrive at some common ground by compromise. A method which under certain conditions can be made fairly satisfactory may fail entirely when attempts are made to apply it under practical working conditions.

As may be inferred from the foregoing introduction it is the purpose of the writer to point out certain objectionable features in the biological assays which are either suggested or required in the 9th Revision of the U. S. Pharmacopœia (2).

We will assume, as the Revision Committee evidently did, that a biological method can be found which is a measure of therapeutic value.

It is very natural that opinions should differ among pharmacologists as to which reaction more nearly represents the activity of a drug, when the drug has a number of apparently different therapeutic uses.

It is no more remarkable that differences of opinion exist as to which is more accurate, if several assay methods are available. One can expect therefore that the methods adopted would be subjected to criticism, for in this way only can errors be eliminated.

THE DIGITALIS SERIES OF HEART TONICS.

The method adopted for the assay of the digitalis series of heart tonics is that known as the one-hour frog heart or the minimum systolic dose (M. S. D.) method.

In a review of the various methods in use Edmunds and Hale (3) eliminated most of them as illogical or inaccurate. These authors found little reason for choice between the one mentioned above and another known as the minimum lethal dose (M. L. D.) method.¹ Their preference inclined toward the former on the basis of cost and time.

This method leaves much to be desired in regard to accuracy and dependability, since if one economizes either in time or in material it is usually at the expense of accuracy.

¹ The M. L. D. or minimum lethal dose method is described in detail by Houghton and Hamilton (4). The M. L. D. is the smallest dose per gram weight of frog which kills a majority of the test animals, the correctness of the end point being verified by observation of the laid-bare heart, which is in systole, if death is due to the uncomplicated action of one of the digitalis series.

This method is subject to the same variable factors as the M. L. D. method, namely, temperature, season, different species of frogs and their individual susceptibility with the additional disadvantage that absorption becomes a more serious factor on account of the shorter time of action. The apparent advantages—fewer frogs and shorter time—are under some conditions real disadvantages because in case of delayed absorption a frog's heart will be found beating in 1 hour, even when dosed with the M. S. D. while the M. L. D. would not be appreciably affected. Another important point in connection with the end point in the M. S. D. method is the effect of pithing the frog and laying bare its heart. Is it reasonable to suppose that this has no influence on the condition of the heart? Whatever this influence is it can scarcely be inferred that this is an invariable and uniform effect. The method therefore introduces one more factor, the effect of which tends towards variability rather than in the direction of increasing accuracy.

After an extended series of tests Hamilton & Rowe (5) found that the M. S. D. of digitalis is less than the M. L. D., showing that an early paralysis of the heart occurs which may be the cause of the observed indefinite end point. This paralysis seems to have no uniform relationship to the M. L. D. since in some cases the M. L. D. and M. S. D. were identical, while an average of 14 experiments showed the latter to exceed the former by 22 per cent. in the case of fluid extracts, and 36 per cent. in the case of tinctures, the latter being an average of 12 tests. In one assay of a tincture by both methods the M. L. D. exceeded the M. S. D. by 60 per cent.

The conclusion of Edmunds and Hale that choice between the two methods is largely one of convenience seems unwarranted. The most uniform end point, and the most logical, is that where the sample of a digitalis preparation has an opportunity to complete its cycle of effects and to be measured by the size of the minimum dose which causes death of the frog with heart in systole. Any other stage in this cycle is more variable and therefore less accurate as an end point for the reaction.

The standard, ouabain, adopted by the committee for comparison in measuring the activity of the digitalis series of heart tonics is also open to criticism because it is obtained from a non-official strophanthus seed and because different lots are not uniform in composition.

While it is true that the standard, in physiological assaying, is merely to measure the resistance of the frogs, this resistance is of

such a complex character that it should be measured by a standard, not in any respect open to criticism. The standard, if not identical with the sample, should be one whose composition and identity has been established.

The description of ouabain indicates that it is derived from a non-official *strophanthus* seed, that its composition is indefinite in that it crystallizes with varying quantities of water and that it does not yield a crystalline *strophanthidin* and cannot therefore be assayed chemically to establish uniformity. That it is not uniform is shown by Rowe (6), a conclusion which may be deduced from the fact that the M. S. D. of ouabain accepted by the U. S. P. Committee is .0000005, while the average of the three samples tested by Rowe is .00000086 or 76 per cent. more—a difference not due to temperature, because in all cases the tests were carried out at 20° C. Further it is an expensive substance and obtainable only by importation. These and perhaps other objections would certainly have been brought out by the ones who must use the test if such an opportunity had been granted.

Strophanthin from *Kombe* seed can be made of uniform composition and activity according to Brauns and Closson (7) and is therefore preferable to ouabain for every reason, but its use seems especially logical because of being derived from the official *strophanthus* seed.

Cannabis.

The biologic assay of *cannabis indica* is another that is open to criticism, not only in the wording of the text, but in the size of the test dose and in certain of its details.

As to the words used, the statement is made that *cannabis* “produces incoördination when administered to dogs in a dose of not more than 0.03 mil of fluid extract, . . .” How much smaller dose will show a similar, but less marked effect? What is the effect of a larger dose? A logical wording would be that Standard F. E. *Cannabis* produces incoördination in a dose not less than, etc.

The dose chosen is too small for a satisfactory test. The average dog will scarcely react to a dose of this size and if the drug is somewhat less active than standard, the animal will not react visibly. Under the rather drastic conditions imposed, some dogs will show the effect of *cannabis* to a fairly satisfactory degree, but a large majority will show the effect very slightly if at all—a statement corroborated by Pearson (8).

A much more satisfactory test dose of a standard cannabis preparation is one which when administered under proper conditions will show a well-marked action. Then if the preparation being tested is somewhat less active than standard or the dog slightly less susceptible than normal, an evident although less marked effect is produced. In this way a measurable difference can often be established, a difference which can be verified by a second test. A dose of 0.1 mil of the standard fluid extract does not produce an effect too great to obscure the reaction of a sample, slightly more or less active than standard. This dose is therefore recommended as the standard test dose. In a former communication the author (9) suggested 0.01 Gm. as the dose for the extract and a minimum dose of 0.09 mil (Cc.) of the fluid extract.

Testing the standard on each occasion is an unnecessary and expensive procedure, since a dog proved to be susceptible to the standard to the proper degree remains fairly constant for a long period, if in good physical condition. This is admitted in the official description of the test animals (2).

Testing a sample on two dogs which have been chosen because of being susceptible to the standard test dose of cannabis is sufficient unless one or both exhibit a reaction very different from that to be expected. In such a case the susceptibility of the dogs should be reestablished.

Starving a dog for twenty-four hours is a longer period than necessary. Twelve hours is generally sufficient to empty the stomach, and is less trying on the test animals.

Regarding the standard, some more exact method should be devised for obtaining uniformity among manufacturers. As prescribed by the U. S. P. the activity of a sample depends on the susceptibility of the dog, and it may be any kind of a dog.

If a test is attempted for the first time and no reaction follows, how can it be determined whether the sample or the animal is at fault?

Since the test is compulsory it should be the duty of some central authority to supply a sample which meets requirement to every manufacturer of cannabis products, and so insure the uniformity which is planned to attain.

It is an unnecessary requirement to compare each cannabis preparation with the standard in the same form. If the standard is in a stable form it can be considered equally active if .004 Gm. is in ex-

tract, fluid extract or tincture form, while in fact the statement "A standard fluid extract will produce incoördination when administered to dogs in the dose of 0.03 mil, the extract in the dose of 0.004 Gm., the tincture in the dose of 0.3 mil for each kilogram of body weight of dogs," gives one no option in dosing, and practically makes a test of the standard unnecessary. The effective dose of each is prescribed without any opportunity of varying it to adjust for a lower susceptibility of the test animal. If the method provided for this contingency, it would be logical to compare sample with standard in every case and to eliminate every possible cause for unequal effects.

Further criticisms of this test of cannabis preparations are that the drug, while intoxicating in a sense is not known to be fatal in a relatively immense dose and consequently is not a dangerous drug; and that it has no very extended application in human therapy. It therefore scarcely deserves so much attention especially when the extra refinements of testing suggested add so little to uniformity in the activity of its extracts and so much to the cost of standardizing.

Suprarenal Gland.

The biologic assay of products of the suprarenal gland is open to criticism in only two particulars, namely, in the method of measuring and administering the doses and in attempting to check the results as described.

Using both femoral veins for injecting sample and standard alternately is probably intended to obviate the possible mixing of the two solutions if both are injected into the same vein. But it introduces a very much greater source of error. The amount injected can much more easily be measured by use of a pipette than in a syringe, and the dose after being injected can be easily and completely washed into the blood stream by a follow-up injection of 2 mil (Cc.) physiological salt solution. When this procedure is followed, no mixing of two injections is possible.

By the U. S. P. method it is difficult to measure accurately small differences in the dose, and impossible to insure that the entire dose enters the blood stream. The small part remaining in the dead space of the vein seems to be destroyed, because doses administered by the U. S. P. procedure are invariably less effective than when immediately and completely carried into the blood stream by the method suggested above.

The requirement of checking an assay by making the injections of sample and of standard into the opposite sides from those first used is no check except in so far as it checks conditions on the two sides of the dog. This feature can better be eliminated by using only one side. Further, by the official method, if it is impossible to complete the test and the check on a dog, no option is left, but to repeat both test and check on another dog. It is occasionally necessary to check an assay on a second dog when conditions during the first test were unfavorable for accuracy, but no advantage results from a retest on the same dog.

Pituitary Gland.

The assay of liquor hypophysis, while not included in the biological assays on page 604 *et seq.* is none the less biologic. It is also compulsory for a U. S. P. product. It is open to criticism because of the nature and dose of the standard and because of the unsatisfactory character of the test reaction chosen.

First as to the standard, it seems unwise as well as unnecessary to choose as the standard a substance which has only one of the typical physiological effects of hypophysis, and which alone has no therapeutic application equivalent to that of extracts of the pituitary gland.

In a previous communication (10) the author described the means of obtaining a satisfactory standard test solution, this being a fresh solution of the water-soluble part of the dried, defatted, powdered infundibulum.

Because of the possible variation in the content of active agent in different lots of glands, a stable, highly active, water-soluble powder prepared by Aldrich (11) has been largely substituted in the commercial standardization of pituitrin. The dried glandular substance first mentioned, however, can be easily prepared and is well adapted to the purpose of making the standard test solution.

This has the distinct advantage over histamine of being identical in action with extracts of the glands both on the isolated uterus and on other unstriated muscles, especially those controlling blood pressure.

Active extracts of the pituitary gland are remarkable for their action on smooth muscular tissues, contracting the uterus and intestinal muscles and the walls of the veins and arterioles. As results

of this action, the blood pressure is raised, peristalsis is increased and the tone of an inert uterus is aroused.

It is logical to assume that all the effects are due to a constituent which acts on unstriated muscle and to choose one of these as a test reaction—one which is accurate and measurable. If, however, the action on the pregnant uterus is due to a constituent other than that which affects the blood pressure, then it is essential that the oxytocic test be applied to those preparations intended for obstetrical work. But for the assay of such as are used to control the blood pressure in cases of shock it would be necessary to apply the blood pressure test.

While some investigators, notably Fühner (12), claimed to have produced evidence that two or more constituents are present in an active extract, others have found the two principal effects to go hand in hand, pointing either to the presence of only one active constituent or to a constant ratio in the content of the two constituents. Roth (13) whose work was probably the basis for the choice both of the method and the standard test dose, submitted little conclusive evidence for his choice of the oxytocic method. He made his selection because "the simplicity of the isolated uterus method, together with the fact that the uterus of the virgin guinea pig shows little variation in its reaction to pituitary extracts even after hours, places it above other methods in point of desirability as a method." His objection to the blood pressure method is "that one encounters a degree of tolerance when a second or succeeding dose is given."

On the latter point he submits as evidence of toleration a series of 14 consecutive injections of pituitrin, only 9 of which, however, illustrate his point. Each of the first five were followed by an almost identical rise in pressure, while the others were made in a manner contrary to his own suggestion, namely, "the period between injections to be at least 30 minutes long." The nine injections were made with an average interval of 5 minutes and into a dog which was apparently incompletely anesthetized. He submits no evidence whatever on the point that "little variation is shown in the reaction of the isolated uterus to pituitary extracts even after hours."

While the method is apparently simple the test strips of uterus muscle which will respond differently to different sized doses with any degree of accuracy are so few that a dependable test can rarely be made. On the other hand a blood-pressure test can be made on dogs with few exceptions and the "tolerance" referred to is scarcely

to be observed when testing a good carefully prepared extract. It can be eliminated entirely as a factor by the alternate injection of sample and standard. These facts are brought out and illustrated by Hamilton & Rowe (14), who suggest that clinicians working in conjunction with pharmacologists aid in determining which reaction more nearly coincides with therapeutic value. No positive evidence has yet been brought forward to prove that the blood pressure test carefully carried out is not a direct measure not only of pressor, but also of oxytocic activity together with its action on the kidneys, intestines and the mammary glands.

When a therapeutic agent such as the extract of the pituitary gland has been in practical use for nearly ten years and through clinical as well as laboratory experiments has been standardized to a certain degree of activity—a strength demanded by obstetricians and surgeons as essential for obtaining the desired results—any readjustment of activity should be made with extreme caution.

The revision committee, however, ignored this phase of the question and have adopted a standard activity for *Liquor Hypophysis U. S. P.* 9th, considerably below that of the standard preparations on the market.

To make an official extract from this gland material conforming in every respect to *U. S. P.* requirements lowers the standard from that at present generally used by the medical profession to one only 40 per cent. as high activity. Is there not reason enough for Dr. Rusby's statement that "it may safely be said that its (biological standardization) efficiency and authority were seriously doubted by a large majority of the medical profession"?

It is in many cases difficult enough to answer the question "Is the sample of drug that has been found to possess the greatest power to kill a cat the one that will prove most efficient in curing a man?" The advocates of biological standardization are now in the position where they must either ignore the official "biological assays" or be forced to justify methods which are in part at least illogical and inaccurate and standards which are not in line with medical requirements.

Considering the present status of biological standardization this is an unfortunate situation.

SUMMARY OF OBJECTIONS TO THE OFFICIAL BIOLOGICAL ASSAY METHODS.

THE HEART TONICS.

- 1st. The inaccurate method because the end point is obscured by (a) variable rate of absorption, (b) shock in exposing the heart.
- 2d. The standard, because it is not from the official drug and is not uniform in composition or activity.

CANNABIS SATIVA.

- 1st. The inaccurate wording in the text.
- 2d. The smallness of the test dose.
- 3d. The absence of a uniform standard.
- 4th. The non-essential features which add to the complications of the method with no commensurate gain in the activity or uniformity of the product.

SUPRARENAL GLAND.

The complications introduced into the test:

- (a) The inaccurate manner of measuring the test dose.
- (b) The incomplete administration of the test dose.
- (c) The method of making a check assay.

PITUITARY GLAND.

- 1st. The inaccurate and unsatisfactory character of the method.
- 2d. The standard, which is not adapted to measuring blood pressure activity, is not a practicable oxytocic agent in therapeutics and is not derived from the pituitary gland.
- 3d. The activity of the standard product.

From the Research Laboratory of Parke Davis & Co.

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THE PHARMACEUTICAL USE OF THE FILTER PRESS.

BY JAMES F. COUCH AND JAMES E. KERSEY.

Filtration may be defined as the resolution of a disperse system into liquid and solid phases by means of a diaphragm permeable by the liquid only. In practice such a perfect separation of the system is seldom, probably never, realized. We submit mixtures to a process of straining whereby all particles which are larger than a certain minimum size are retained by the strainer and all others pass through into the filtrate. The filtered liquid may at first appear crystalline, yet after months of undisturbed standing on a shelf a slight, fine precipitate will be found in the bottom of the container caused by the agglomeration and deposition of the invisible particles which the strainer did not retain.

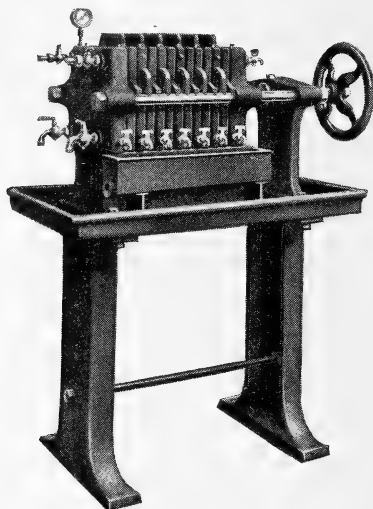
Accomplishment of the most complete separation of the phases in a minimum of time constitutes the problem of filtration. Let us consider the various means employed for its solution.

In general, filtration processes may be divided into two classes: first, those which depend upon gravity, and second, those in which extra pressure is employed. Of the first class the most commonly used is the funnel and filter paper method. This is adapted to all sorts of variations and is quite satisfactory for small volumes of liquids. Its great disadvantages consist in the continual diminution in the rate of filtration and the evaporation of solvent from the surface of the mixture which causes a change in the menstruum, a rearrangement of the solution, and, possibly, precipitation with the first portions of filtrate. If a filtering agent is used with the paper the rate of filtration is retarded still more and may be entirely stopped while the volume of liquid absorbed, and consequently lost, is very much increased.

Filter bags of felt are occasionally employed. They are useful for hot filtration or for syrups but are slow and permit visible particles, notably starch, to pass through, so that filtrates from them are frequently cloudy. Straining through cotton or woollen cloths is resorted to when coarse precipitates are to be separated but this method has only a limited application in pharmacy.

There are in use devices for securing added pressure in filtration by contriving a column of liquid several feet in height in such a way

that it may exert force upon the liquid which is filtering. Such arrangements are intricate, involve an undue amount of room, and may present difficulties in cleansing.



The Sperry laboratory or 10" filter press equipped with plates and frames which are convertible into the various arrangements used in commercial apparatus. It can be used as a press equipped for "Thorough Washing" or "Simple Washing." Arrangements are provided so that either of the above two arrangements can be used with separate discharge for washing or not, as desired. Filtrate can be made to discharge from separate cocks, from each plate or from one large cock at the head of the press. In practice the former arrangement is called "Open Discharge," while the latter is known as "Closed Discharge." It is a commercial machine in every respect. Other sizes are 18", 24", 30", 36", and 42". Plates and frames can be made of iron, as shown in the cut, or of lead or wood.

Added pressure secured by means of the suction pump or aspirator is very infrequently of use in pharmacy. The most serious objection to this method arises from the fact that the filtrate is necessarily exposed to low atmospheric pressure and under such conditions the volatilization of alcoholic menstrua is so rapid that it condemns the process.

Centrifugal filters are rapid and efficient. They are, however, better adapted to cases where the solid matter is the desired product, as in the separation of mother liquor from crystals, than for strictly pharmaceutical purposes where the insoluble substances are com-

monly worthless. The centrifuge is wasteful; it splashes the filtrate about the outer jacket and, unless the center of gravity is carefully maintained in the shaft, will vibrate, shifting the "cake" and upsetting the filtration.

In the filter press process the liquid to be filtered is pumped through the filtering medium. The rate of flow can be easily controlled and the amount of pressure exerted adjusted to the particular conditions. Loss of material due to slopping or evaporation may be reduced to a minimum and, once started, the press may usually be left to itself to complete the operation. The method has the disadvantages of requiring expert handling, the absorbed liquid is likely to be large, small quantities cannot economically be filtered through the press, and the cleaning of the apparatus is a matter of some labor.

The press used in the laboratory of the Standard Chemical Company is a small Sperry machine of six chambers. The liquid is fed into the press by a single-plunger, belt driven pump equipped with an air chamber and safety tube. The *modus operandi* is as follows:

The liquid to be filtered is prepared by proper aging, with or without the addition of filtering agent according to conditions, and is then filled into barrels which are connected with the pump. A quantity of a filtering agent is now put into the liquid and thoroughly stirred in so that it may enter the press gradually with the liquid. This is an important detail and, if not observed, the press will clog when resinous or mucilaginous precipitates are present.

The liquid is sucked into the pump through an iron pipe connected with a rubber tube of convenient size which is lowered into the barrel. The open end of this tube should be protected by a piece of sieve rolled into a cylinder and fitted so as to form a prolongation of the tube. This precaution prevents the entrance of coarse particles which might lodge in the pump valves and interfere with their proper action.

The pump should be selected with care. We consider a motor-driven pump preferable to a steam-driven pump for general pharmaceutical use for the reason that the steam power available in the average pharmaceutical house will not be adequate to overcome a back pressure of one hundred twenty pounds in the press, a pressure often encountered. The number of cylinders desirable increases with the size of the press and the filtering surface to be fed. A three-cylinder pump will deliver a steady stream of liquid prac-

tically free from pulsations but, if an air chamber is attached, a single plunger will answer pharmaceutical requirements.

The plunger should admit of adjustment so that the volume of liquid delivered at each stroke may be varied to compensate the viscosity of the mixture being filtered. True, this might be controlled by varying the speed at which the pump is driven or by proper regulation of the safety tube but either of these methods involves other difficulties which make it more practicable to adjust the plunger. Our plunger is $2\frac{3}{4}$ in. in diameter with a full stroke of $1\frac{1}{2}$ in., so that the total volume which may be delivered at each stroke is about 5 (4.935) fluidounces. It may be adjusted to any lower volume and, for filtering light liquids, we regulate it to three fluidounces per stroke.

The speed at which the pump should be run is determined by the filtering area of the press and the volume of liquid delivered by each stroke of the pump. This must be determined by direct experiment. The ideal condition is the one where the volume of liquid forced into the press by the pump is just enough to fill the chambers and keep up a steady flow of filtrate without causing an undue increase in pressure. We operate our pump at a rate of sixty strokes per minute, which gives us a possible capacity of 140 gallons per hour. This is never attained in practise; with most fluid mixtures we operate at a rate of from seventy to ninety-five gallons per hour.

The valves of the pump should be easily accessible so that they may be readily cleaned during and after the filtration. Small particles of solid matter derived from sugar or chemicals frequently lodge in the valves, interfering with their proper closing and so causing leakage. This decreases the efficiency of the pump and may become serious enough to stop the filtration. A little practise will enable the operator to determine which valve is affected.

The packing around the plunger should be of the cold-water type firmly embedded in place. Yet, with the utmost precautions, there will be a small amount of leakage through it whenever the pressure rises above one hundred pounds per square inch. Below this point leakage may be prevented.

The pump is connected with the press by an iron pipe of suitable size ($\frac{3}{4}$ in. is convenient), so arranged that it may be taken apart and cleaned. A safety tube, closed by a gate valve, is fitted into this by a T. The function of the safety tube is to return to the barrel any excess liquid which the pump is delivering to the press

above the amount which the press is filtering. This affords a second means of controlling the pressure and is of service in those cases where the pressure gradually rises during the filtration as the cake of precipitate thickens in the chambers. With easily filtered liquids the safety tube may be kept closed and it should never be opened until rising pressure, indicated on the gauge, demands some release.

The air chamber may be placed anywhere between the pump and first chamber of the press on the connecting pipe. If a single-plunger type of pump is employed the air chamber becomes a necessity to equalize the pressure. Without it, the pressure will vary during each stroke of the plunger, sometimes as much as eighty pounds, rising and falling in pulsations. The effect of such a continual pounding is to pack the cake firmly in the chambers and eventually this concreted wall becomes impenetrable and filtration ceases. The air chamber takes up the excess pressure and, even with the most refractory liquids, diminishes the variation in pressure to, at most, twenty pounds. A pet cock should be fitted to the lower extremity of the air chamber to allow it to be drained and cleaned.

The pressure gauge is usually placed just before the first chamber of the press. Its functions are too obvious to require comment here.

After leaving the pump the liquid enters the press, is conducted by a channel into the several chambers, passes through the filter-paper walls, and drains out at the bottom into a trough which leads it into a covered receptacle.

The press consists of a number of solid plates of iron separated by hollow "distance" frames so arranged that the whole may be securely clamped together, forming a series of chambers or cells. Lateral openings connect them with the channel, through which the mixture enters, bored throughout the length of the press and terminating in a pet cock which is used to permit the escape of air when the press is started. The vertical walls of the chambers are formed by the solid plates which are corrugated in such a way as to lead the filtered liquid to an outlet in one of the lower corners through which the filtrate is discharged.

The actual filtration is accomplished in these chambers. Heavy sheets of canvas are suspended over the faces of the solid plates and, for technical use, these serve sufficiently well; for pharmaceutical purposes, however, better filtration is demanded and the cloth is, therefore, covered with one or more sheets of filter paper. The

paper used should be of good quality and fine weave. Fine gray filter paper answers well. It is of the highest importance that cloth and paper fit well and lie smoothly on the plates; wrinkles and up-turned corners prevent the proper closing of the press and furnish channels for the escape of liquid. It is also important that the press be closed as tightly as possible to prevent spurting from the chambers.

During the filtration the chambers become filled with a mixture of filtering agent and precipitate: in most cases it is possible to add just sufficient talc or kieselguhr to the liquids to fill the chambers as the last of the liquid enters and this can be determined by experiment; however, should the chambers fill before the liquid is all through, the press should be drained by pumping air into it and then should be cleaned and readjusted.

The amount of material left in the chamber after filtration depends largely upon the nature of the filtering agent used. We employ kieselguhr almost exclusively, for reasons given below, and find that each chamber when filled under pressure will hold 18 ounces (av.) of dry kieselguhr which will absorb and hold 28 ounces (av.) of liquid. We have no figures for other agents.

The absorption of liquid, as we stated above, constitutes one of the disadvantages of the filter press and yet it is no larger, for a given volume of liquid, than the absorption in ordinary gravity filtration. The absorbed liquid may be recovered by pumping a small quantity of water through the press, but that method involves pharmaceutical difficulties. We drain the press by pumping air into it, thereby forcing a large quantity of the absorbed material out; that which remains behind is lost.

It may be said that every liquid to be filtered presents a new problem and requires individual treatment but, for practical purposes, we can divide preparations into four classes, three of which depend upon the viscosity of the liquid which, in turn, depends upon the nature of the ingredients present and the character and amount of precipitation.

The least troublesome class of liquids comprises the very fluid elixirs and solutions, such as simple elixir, essence of pepsin, elixir of iron, quinine, and strychnine phosphates, and the various elixirs of "lactated" pepsin. These preparations commonly filter rapidly without elevation of pressure and with little decrease in the rate of filtration.

More viscous liquids, such as heavy elixirs, light syrups, solutions of resinous drugs, or preparations which contain large amounts of glycerin or pepsin, filter more slowly and require from twenty to eighty pounds pressure per square inch. Successful manipulation of this class of liquids depends upon judicious use of filtering agent and adjustment of the safety tube. The liquid will automatically regulate the pressure in most cases and the operator can judge the condition of filtration by the flow of filtrate. It is a mistake to attempt to force the filtration by increasing the pressure as this procedure nearly always results in clogging. It is better to adjust the volume delivered to that which issues from the press by shortening the stroke of the pump and, in this connection, it is well to make notes of the conditions and difficulties observed during the filtration of a preparation for such notes will save time and trouble on future batches.

The class of liquids which requires the most art in handling is that which comprises the very thick, heavy, viscous, or mucilaginous solutions and fluids complicated by a large amount of precipitation, particularly of starch or dextrin. Trouble may always be expected from preparations of rhubarb, buchu, uva ursi, senna, and gentian if, as is frequently the case, the drugs have been percolated with menstrua of low alcoholic content. That difficulty can be avoided by proper pharmacy yet it does occasionally present itself. However, all such liquids may be successfully filtered in the press if due attention be paid to the conditions. It may be necessary to age the fluid first and this is desirable where there is precipitation of starchy matters. Mucilage is the most difficult complication to deal with. The best and proper way to eliminate it is to leave it in the drug in the percolator, for when it gets into the finished liquid all there is left to do is to summon all available patience, use plenty of kieselguhr, and throttle the pump down to ten gallons per hour. In filtering liquids of this class it may become necessary to stop the operation for the purpose of cleaning the chambers, washing the cloths and adjusting fresh papers on them. This removes a mass of precipitate and gives the liquid a new opportunity to pass through. It is worthy of note that it is practically impossible to filter such preparations clearly by gravity.

Occasionally it will be found advantageous to line the chambers with a layer of filtering agent before attempting to filter the preparation in hand. This procedure prevents the precipitate from enter-

ing the interstices of the paper and clogging it. To line the chambers it is necessary only to mix a small amount of filtering agent with five gallons of water and pump the mixture through the press continuing until all the water is drained out. In general, the first liquid which flows from the press will be cloudy and a clear filtrate will not be obtained until a small layer has formed on the papers.

The fourth category of liquids is represented by strongly alcoholic or ethereal fluids. With these the press has a decided advantage over all other methods for filtration, for by employing the channel into which the chambers drain it is possible to filter such mixtures with a minimum of loss of solvent.

The selection of the filtering agent may decide the success or failure of the process. Some such agent is necessary in all pharmaceutical uses of the press to assist in the solution of oils, to dilute gummy or resinous precipitates and prevent them from clogging through deposition in the interstices of the papers, and to form nuclei on which microscopic particles of precipitate may agglomerate and form grains of filterable size. Kieselguhr, talcum, kaolin, magnesium carbonate, and calcium phosphate may be used and their practicability appears to be in the stated order. Kieselguhr is universally applicable; it is light in texture, fine in size and does not pack firmly on the papers. It is chemically quite inert. Sometimes an admixture with talcum may be used and, for heavy work, this is judicious. Talcum itself is second only to kieselguhr, but is likely to pack firmly on the papers, which unfits it for use with viscous liquids.

Kaolin cannot be used in the presence of mucilage, starch, digestive ferments, or ox gall, with which it forms a slimy mass that clogs persistently and so decreases the rate of filtration. For simple elixir and similar preparations it will serve, but presents no advantages over kieselguhr. Magnesium carbonate and calcium phosphate are excluded from nearly all mixtures by their chemical activity. It is probable that much of the precipitation which has occurred in bottled preparations may be traced to the use of either one of these salts in filtration. Neither of them has any advantages not possessed by kieselguhr. They should never be used in acid liquids and the magnesium compound will precipitate acid coloring matters, i. e., carmine, from solution.

The best results cannot be obtained even if all the above mentioned points are scrupulously observed unless the apparatus itself is

well cared for. It should be thoroughly cleansed after each filtration by removing the distance frames with their accumulation of precipitate and pumping water through the press. The cloths should be washed in hot water with the addition of appropriate chemicals if necessary. The papers will serve for but one filtration and should be thrown away at its conclusion. When heavy precipitates have been filtered out the pump should be taken apart and cleaned, the connecting pipes, safety tube and air chamber should receive the same treatment. This must be done shortly after the filtration for pharmaceuticals soon dry onto iron and the masses adhere so tenaciously as to make the cleaning a matter of considerable labor.

In all cases it must be remembered that the filter press is a delicate piece of apparatus and demands careful attention to produce the best results. We believe that it has a place in pharmaceutical manufacturing which cannot be taken by any other filtering process in use at the present time. It may be difficult to adjust it to suit some certain condition sometimes, but it always amply repays the labor spent upon it. It is substantial and less liable to serious injury than most pharmaceutical apparatus. The products filtered through it are as elegant in appearance and as stable as the best. Its use indicates a distinct advance in pharmaceutical manipulation.

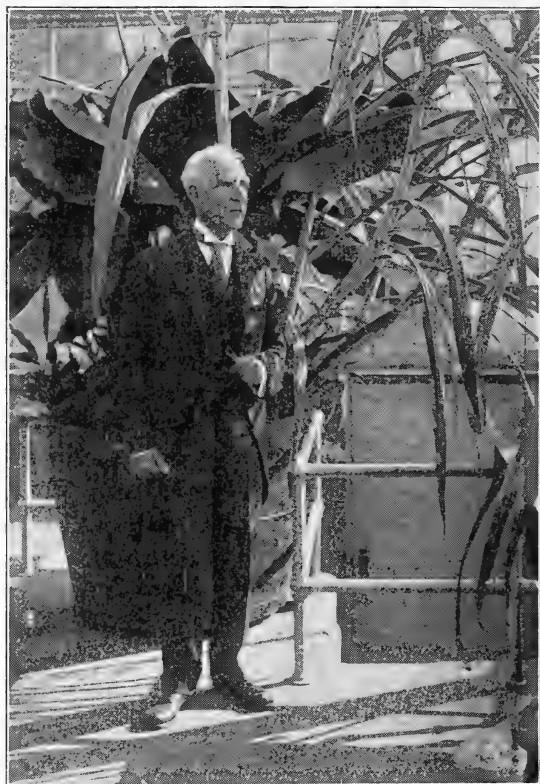
(Contribution from the Pharmaceutical Laboratory of the Standard Chemical Co., Des Moines, Iowa.)

THE TEXTBOOK AND THE COLLEGE.

DEAN LUCIUS E. SAYRE, UNIVERSITY OF KANSAS SCHOOL OF PHARMACY.

Dean Lucius E. Sayre, of the college of pharmacy of the University of Kansas, visited the University of Minnesota during the week of October 23. On Thursday morning he was introduced to the students of the college of pharmacy by Dean Wulling and delivered a most interesting address. In introducing Professor Sayre, Dean Wulling stated that the college of pharmacy of the University of Minnesota had contemplated for many years the securing of prominent pharmacists in both this country and abroad for special lectures and that while not as many such speakers had been obtained as the college had hoped for, yet some of exceptional note had already lectured, and that others would probably be secured in

the near future. Dean Wulling referred to Professor Sayre as one of the leaders in American pharmacy, stating that he was one of the foremost pharmaceutical educators in this country.



Professor Lucius E. Sayre, Dean of University of Kansas School of Pharmacy.

Dean Sayre prefaced his remarks by congratulating Minnesota pharmacists on having a central institution such as the University of Minnesota College of Pharmacy. He congratulated Dean Wulling, not only on his pharmaceutical activities in Minnesota, but also as past president of the American Conference of Pharmaceutical Faculties and as the present president of the American Pharmaceutical Association.

Dean Sayre stated that he had selected as the topic for his lecture "The Textbook and the College." He asserted that there

are too many textbook pharmacists and too few college pharmacists. He felt that there was great need for more personal contact between the pharmaceutical instructor and the pharmaceutical student, that there should be a direct study of many of the problems concerning pharmacy and that individual textbook review could not possibly give the kind of training which pharmacy demands today. The college of pharmacy, he felt, should represent a collection and a coöperation of students, including the instructors and professors, all of whom should work together as scholars for the solution of the problems of the profession.

In commenting on the duties of the student, Dean Sayre called attention to the fact that their studies should not end with graduation but rather that they should continue as long as the individual carried on pharmaceutical work. The pharmacy students of today will take positions in the future along commercial and professional lines, he said. They will handle the pharmaceutical legislation in the days to come.

Dean Sayre referred at some length to the extensive discussions of the present time concerning higher educational requirements for pharmacists. He stated that college work was essential and referred to Professor Newcomb's reports on the conventions of the A. C. Ph. F., N. A. B. P., and the A. Ph. A., which, he stated, truly indicate that all pharmacists are gradually coming to recognize that the requirement of college work would be advantageous to pharmacy.

The question as to whether or not drug clerks are scarce was discussed. Dean Sayre asked whether or not the scarcity of clerks was due to our present educational requirements, and in answering he stated: "I am inclined to believe that it is not high requirements, perhaps, so much as, maybe, it is low requirements that are promulgated and fostered by certain individuals and institutions. The 'short course' and makeshifts for an education tend to lower the vocation so that young men of ability, who might be attracted to it, are rather repelled.

"Recently it happened that a drug clerk, who has had considerable experience as a clerk in Kansas, came into my office. I asked him to express his views as to the cause of the scarcity of drug clerks. He remarked that it was his experience that young men were being discouraged from entering the pharmaceutical profession because of the fact that standards were so low that the business was not attractive to them. The output from the short-course

schools was filling the vacancies, discouraging good education and training.

"This young man had come from 'filling in' a position in one of the stores in a lively town of the state. On leaving, the proprietor told him that he had never had a clerk with whom he was satisfied until he had hired a college man. A few days before this young man left the store referred to, the proprietor told him he was very glad to have had him because it had taught him how valuable a trained college pharmacist was to a store.

"This testimony, it should be said, was not prompted by any views expressed by myself."

Furthermore Dean Sayre said that college education is necessary in order that our after lives may be satisfactory to ourselves. He urged college men to continue their pharmaceutical activities through alumni association work. He stated that in Kansas there were 1,000 pharmacists who had never taken college work and that these men had soon come to be at a disadvantage with the college men, and that college men are usually well rounded and broad commercially and scientifically. The results of an investigation concerning the location and occupations of 1,000 graduates of the University of Kansas were discussed and he stated that the college men carry on a great diversity of work and that they were uniformly successful.

Dean Sayre discussed the college curriculum in relation to the students, stating that the college should be broad and that it should attempt to educate and train young men and women for whatever locations they, as pharmacists, may find themselves in the future. He strongly urged students with special likings to take advanced work along these lines. Students who follow specific lines are more likely to meet with exceptional success, he declared.

Close acquaintanceship among students was recommended and the value of such comradeship was emphasized by reminiscent remarks concerning the time when the speaker was a student at the Philadelphia College of Pharmacy, where lasting friendships were formed with such men as Maisch, Procter and Parrish. Following this thought further the value of association with men of national reputation was emphasized.

Dean Sayre expressed the hope that what he had said would not be taken in any way as an attack upon short-course schools but rather it was his belief that such courses should be lengthened to a

minimum in proportion with the needs of the profession of pharmacy. Dean Sayre said:

"Success in pharmacy has become synonymous with success in business. But what of the scientific qualifications of the pharmacist. While it is largely true today that the so-called successful pharmacist must be, first of all, a business man, indications all point to the fact that scientific equipment will be the future ruling criterion. The future pharmacist must thus have, more than ever, an attitude which bespeaks scientific, professional confidence as well as business ability. It is for this reason, in part, although, of course, not primarily, that we are ever insisting on increased requirements and longer curricula in our pharmacy schools. Commercialism has taken all too deep root in our profession and nothing but a healthy scientific spirit can adequately counteract it. Young men leaving schools of pharmacy should be alive to this fact and be sympathetic toward the advances of the morrow. It may be that the future will insist on a quality of intellect that we shall have to change from the quality of affability and business acumen to an air of intellectual competency. Those who are closely in touch with the medical profession today know this demand of the future is imperative for greater professionalism.

"One of our writers on commercial pharmacy insists that pharmaceutical education needs rebuilding, that it should tend to a larger instruction in business methods and that the strictly professional lines should be subservient, that the object of the preparation for the boards of pharmacy examinations shall be changed to an accomplishment of better business training. What folly could be worse! While we have not ignored the value of business training, any observer of our pharmaceutical life can readily see that we are now steeped in a commercialism which threatens the very existence of our profession. The nation, the state and the public in general regard us as a profession. If this halo were to be removed from our corner drug store and we should be obliged to enter into competition with the grocer, butcher, etc., pharmacy would cease to exist."

The speakers discussed the general question of patent medicines and emphasized the importance of pharmacists taking an active part in eliminating fakes and nostrums. He also commented upon the large percentage of drugs and medicines which are not sold by the registered pharmacist and stated that upwards of 35 per cent. went direct to the customers from the hands of the physician. In closing

the speaker stated that the future welfare of pharmacy, in his opinion, would depend on whether it should be more prominent commercially or whether the professional side should be emphasized.

CARREL-DAKIN SOLUTION.¹

To the Editor:—I have just read in THE JOURNAL, Oct. 7, 1916, p. 1108, a short note about the formula for Dakin's solution. I believe that the answer will not allow your reader to obtain the proper kind of solution. Therefore, I take pleasure in sending you the description of the technic which is used in my hospital for the making of the solution.

A. CARREL, M.D.,
Hôpital Temporaire 21, Rond-Royal, Compiègne, France.

PREPARATION OF DAKIN'S SOLUTION (DAUFRESNE'S TECHNIC).

Dakin's solution is a solution of sodium hypochlorite for surgical use, the characteristics of which, established after numerous tests and a long practical experience, are as follows:

(a) *Complete Absence of Caustic Alkali.*—The absolute necessity for employing in the treatment of wounds a solution free from alkali hydroxid excludes the commercial Javel water, Labarraque's solution and all the solutions prepared by any other procedure than the following:

(b) *Concentration.*—The concentration of sodium hypochlorite must be exactly between 0.45 and 0.50 per cent. Below 0.45 per cent. of hypochlorite the solution is not sufficiently active; above 0.50 per cent. it becomes irritating.

Chemicals Required for the Preparation.—Three chemical substances are indispensable to Dakin's solution: chlorinated lime, anhydrous sodium carbonate and sodium bicarbonate. Among these three products the latter two are of a practically adequate constancy, but this is not the case with the first. Its content in active chlorin (decoloring chlorin) varies within wide limits, and it is absolutely indispensable to titrate it before using it.

Titration of the Chlorinated Lime.—There must be on hand for this special purpose:

¹ Reprinted from *Jour. Amer. Med. Assoc.*, December 9, 1916, p. 1777.

A 25 Cc. buret graduated in 0.1 Cc.

A pipet gaged for 10 Cc.

A decinormal solution of sodium thiosulphate (hyposulphite).

This decinormal solution of sodium thiosulphate can be obtained in the market; it can also be prepared by dissolving 25 Gm. of pure crystalline sodium thiosulphate in 1 liter of distilled water, and verifying by the decoloration of an equal volume of the decinormal solution of iodine by this solution. The iodine is prepared by dissolving 1.27 Gm. iodine and 5 Gm. potassium iodide in 100 Cc. of water.

The material for the dosage thus provided, a sample of the provision of chlorinated lime on hand is taken up either with a special sound or in small quantities from the mass which then are carefully mixed.

Weigh out 20 gm. of this average sample, mix it as completely as possible with 1 liter of ordinary water, and leave it in contact for a few hours, agitating it from time to time. Filter.

Measure exactly with the gaged pipet 10 Cc. of the clear fluid; add to it 20 Cc. of a 1:10 solution of potassium iodide and 2 Cc. of acetic or hydrochloric acid. Drop, a drop at a time, into this mixture a decinormal solution of sodium thiosulphate until decoloration is complete.

QUANTITIES OF INGREDIENTS FOR TEN LITERS OF DAKIN'S SOLUTION.

Titer of Chlorinated Lime.	Chlorinated Lime, Gm.	Anhydrous Sodium Carbonate, Gm.	Sodium Bicarbonate, Gm.
20	230	115	96
21	220	110	92
22	210	105	88
23	200	100	84
24	192	96	80
25	184	92	76
26	177	89	72
27	170	85	70
28	164	82	68
29	159	80	66
30	154	77	64
31	148	74	62
32	144	72	60
33	140	70	59
34	135	68	57
35	132	66	55
36	128	64	53
37	124	62	52

The number of cubic centimeters of the hypochlorite solution required for complete decoloration, multiplied by 1.775, gives the weight of the active chlorin contained in 100 Gm. of the chlorinated lime.

This figure being known, it is applied to the accompanying table, which will give the quantities of chlorinated lime, of sodium carbonate and of sodium bicarbonate which are to be employed to prepare 10 liters of Dakin's solution.

Example: If it required 16.6 Cc. of the decinormal solution of the sodium thiosulphate for complete decoloration, the titer of the chlorinated lime in active chlorin is:

$$16.6 \times 1.775 = 29.7 \text{ per cent.}$$

The quantities to be employed to prepare 10 liters of the solution will be in this case:

Chlorinated lime	154 gm.
Dry sodium carbonate	77 gm.
Sodium bicarbonate	62 gm.

If crystalline sodium carbonate is being used, then instead of the 80 Gm. of dry carbonate it must be replaced by:

Crystalline sodium carbonate.....	220 gm.
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Preparation of Dakin's Solution.—To prepare 10 liters of the solution:

1. Weigh exactly the quantities of chlorinated lime, sodium carbonate and sodium bicarbonate which have been determined in the course of the preceding trial.

2. Place in a 12-liter jar the chlorinated lime and 5 liters of ordinary water, agitate vigorously for a few minutes, and leave in contact for from six to twelve hours, over night, for instance.

3. At the same time dissolve, cold, in the five other liters of water the sodium carbonate and the bicarbonate.

4. Pour all at once the solution of the sodium salts into the jar containing the maceration of chlorinated lime, agitate vigorously for a few moments, and leave it quiet to permit the calcium carbonate to settle as it forms. At the end of half an hour, siphon the liquid, and filter it through double paper to obtain an entirely limpid product, which must be protected from light.

Light, in fact, alters quite rapidly solutions of hypochlorite, and it is indispensable to protect from its action the solutions which are to be preserved. The best way to realize these conditions is to keep the finished fluid in large wicker-covered demijohns of black glass.

Titration of Dakin's Solution.—It is a wise precaution to verify, from time to time, the titer of the solution. This titration utilizes the same material and the same chemical substances as are used to determine the active chlorin in the chlorinated lime:

Measure out 10 Cc. of the solution, add 20 Cc. of 1:10 solution of potassium iodid, and 2 Cc. of acetic or hydrochloric acid. Drop, a drop at a time, into this mixture a decinormal solution of sodium thiosulphate until decoloration is complete.

The number of cubic centimeters employed multiplied by 0.03725 will give the weight of the sodium hypochlorite contained in 100 Cc. of the solution.

A solution is correct when, under the conditions given above, from 12 to 13 Cc. of decinormal thiosulphate are required to complete the decoloration:

$$13 \times 0.03725 = 0.485 \text{ per cent. of NaOCl.}$$

The Test for the Alkalinity of Dakin's Solution.—It is easy to differentiate the solution obtained by this procedure from the commercial hypochlorites and from Labarraque's solution:

Pour into a glass about 20 Cc. of the fluid, and drop on the surface a few centigrams of phenolphthalein in powdered form. Dakin's solution, correctly prepared, gives absolutely no change in tint, while in the same conditions Javel water and Labarraque's fluid give an intense red coloration which indicates in the latter two solutions the presence of free caustic sodium.

Apparatus Required for Sterilization of Wounds.—1. One liter bottles, the lower opening with an interior diameter of 7 mm.

2. Distributing tubes with one, two, three or four branches (Gentile).

3. Connecting tubes: (a) cylindric tubes, 2.5 cm. long, interior diameter, 4 Mm.; (b) cylindric tubes, 4 Cm. long, interior diameter, 7 Mm.; (c) Y tubes, interior diameter, 7 Mm.

4. Mohr pinch-cocks.

5. Irrigating tubes. Drain tubes No. 30 (interior diameter, 7 Mm.).

6. Connecting tubes. Drain tubes No. 16 (interior diameter, 4 Mm.), closed at one end. Above this end these tubes are perforated with holes from 0.5 to 1 Mm. in diameter:

(a) Tubes perforated for 5 Cm., 30 Cm. long; (b) Tubes perforated for 10 Cm., 30 Cm. long; (c) Tubes perforated for 15 Cm., 40 Cm. long; (d) Tubes perforated for 20 Cm., 40 Cm. long.

BOOK REVIEWS.

MANUAL OF CHEMISTRY, by W. Simon, Ph.D., M.D., Late Professor of Chemistry in the College of Physicians and Surgeons, and in the Baltimore College of Dental Surgery; and Daniel Base, Ph.D., Professor of Chemistry in the Maryland College of Pharmacy. Eleventh Edition. Cloth, 648 pages; price \$3.50. Lea & Febiger, Philadelphia, Publishers.

This textbook has reached its eleventh edition, which is conclusive evidence of its merits. The revision was probably made necessary by the advent of a new pharmacopœia, but the author (Dr. Base) has taken advantage of the occasion to recast a number of sections, to introduce new matter, and to delete some which is no longer deemed necessary in a book on chemistry, intended for medical and for pharmaceutical students. The book is primarily a textbook—a teaching book—and only secondarily a reference book. This accounts for the arrangement, and for the divisions, Chemical Physics, General Chemistry, Metals and their Combination, and Analytical, and Organic Chemistry. The division dealing with the metals and their compounds, is particularly valuable, and includes besides the descriptive chemistry, a very serviceable compilation of tests. That phase of chemistry which may be spoken of as the philosophical, is dealt with under the heading General Chemistry, and in connection with the non-metallic elements.

The colored plates, on which are reproduced the colors of the more important precipitates in qualitative analysis—plates which have been a conspicuous feature of this textbook, have been retained in this revision.

The paper, type, and binding are excellent. All in all, the eleventh edition of the "Manual of Chemistry" is a worthy successor to the editions which have preceded it, and which have found

their way to the book shelves of many medical and pharmaceutical students.
J. W. STURMER.

HISTOLOGY OF MEDICINAL PLANTS, by William Mansfield, A.M., Phar.D., Professor of Histology and Pharmacognosy, College of Pharmacy of the City of New York, Columbia University. John Wiley & Sons, Inc., New York, 1916.

Vegetable histology is an exceedingly important branch of pharmacognosy. Dr. Mansfield's book, evidently intended as an introductory course to the study of pharmacognosy, should be welcomed to the field because it shows an increasing interest in that subject rather than for any new data presented.

The book is divided into three parts: Part I, consisting of 49 pages, is a brief discussion of the microscope and microscopic technique. The illustrations contained in this portion of the book may be found in the catalogues of the various houses dealing in microscopes. The discussion of microscopic technique is very incomplete and should have been supplemented by references to some of the standard works on this subject.

Part II includes the fundamental consideration of tissues, cells and cell contents, classified from a physiological point of view. This portion of the book is profusely illustrated with line drawings, many of them on a very generous scale, and, with a few exceptions, well done. While the drawings are original, the subjects have been handled by a number of previous investigators. In some cases the drawings are incomplete, which will cause confusion to the student. Plate 30, illustrating collenchyma, and plates 39 and 46, showing root hairs and sieve tubes respectively, are incomplete and misleading, while plate 51 conveys an entirely false impression, owing to the dividing lines between the cells being omitted, a fault even more pronounced in plate 68. Starch grains are shown with a granular or dotted surface, which, while it adds to the attractiveness of the drawings, should be discouraged. The author classifies bast fibers into a number of more or less well defined groups, which would be useful, if nature did not insist upon merging one into another by every conceivable variation. Emphasis is placed upon the study of calcium oxalate crystals, which is noteworthy in that it tends to confirm the studies of Dr. Kraemer, published in a paper and read at the St. Louis meeting of the American Pharmaceutical Association in 1901.

In Part III the histology of the following drugs is given: *Spigelia*, *Ruellia*, *Marrubium vulgare*, *Marrubium peregrinum*, *Buchu*, *Pinus alba*, *Quassia*, *Pyrethri*, *Flores*, *Petroselinum*, *Amygdala Dulcis*. Sections of mountain laurel and trailing arbutus are also given, together with a study of pollen grains and the papillæ of the stigmas of a number of flowers. Of course every author has his own ideas as to proper selection of material for study and will be largely influenced by his own practical experience. An incomplete index handicaps the book for use as a work of reference.

This book will be found valuable in courses of histology where there are well-trained teachers to handle the subject and interpret the author's drawings and statements. It will also be found useful as a work of reference for the special drugs which are considered in detail.

JOHN MOSER, JR.

THE NATIONAL STANDARD DISPENSATORY.—Containing the Natural History, Chemistry, Pharmacy, Actions and Uses of Medicines, including those recognized in the Pharmacopœias of the United States, Great Britain and Germany, with numerous references to other Foreign Pharmacopœias. In accordance with the Ninth Decennial Revision of the U. S. Pharmacopœia. By Hobart Amory Hare, B.Sc., M.D., Professor of Therapeutics, Materia Medica, and Diagnosis in Jefferson Medical College, Philadelphia; Charles Caspari, Jr., Ph.G., Phar.D., Professor of Theoretical and Applied Pharmacy in the University of Maryland, Baltimore; and Henry H. Rusby, M.D., Professor of Botany and Materia Medica in the College of Pharmacy of the City of New York. New (3d) edition, thoroughly revised. Magnificent imperial octavo, 2103 pages, with 465 engravings. Cloth, \$9.50; full leather, \$11.50; thumb-letter index, 50 cents extra. Lea & Febiger, Publishers, Philadelphia and New York, 1916.

With the advent of the new U. S. Pharmacopœia, we are accustomed to the announcements of new editions of the several dispensaries. The first of the latter in the field apparently is the National Standard Dispensatory. When one reaches middle life and has been accustomed to consult this class of works, he is not likely to become very enthusiastic over the new editions. The publishers may say that they have "been revised in every line to cover the latest advances in the whole vast field of Materia Medica, Phar-

macy and Therapeutics," yet anyone who is conversant with the previous editions and the advances of science soon finds on comparison that this is far from the case. In the present work it is stated that the United States Pharmacopœia is "here embodied as a whole," but even this is far from the truth. This opens up an entirely new question in regard to the use of the text of the United States Pharmacopœia and as to whether when permission is granted to publishers to use this text, it should not be insisted that it be used in its entirety. This is hardly the place in a review of a work like this to discuss such questions even though they are prompted by the opportunity for review.

The authors' preface probably gives the best idea of the prominent features of the work which they have written. In the present volume it is stated that "the complete Pure Food and Drugs Act and Regulations, as well as the Harrison Narcotic Law, have been appended, together with the official decisions necessary to their interpretation. This is a very valuable addition, as it contains many of the F. I. D. decisions relating to the regulations concerning the labelling and marketing of medicinal and other products. The pharmacist should have this information at his command, and while the decisions can be obtained from the government for the mere asking, it is very likely that the separate decisions are likely to be mislaid when required for use. Outside of very slight changes, the preface of the present edition is almost the preface of the earlier editions verbatim. It is true that there are some changes in the text and it may be that any number of causes have prevented a more complete revision being made. The statement is made in the preface that "at least 200 new articles have been introduced." Most of these probably relate to the drugs in the National Formulary, but even these are far from being complete.

In conclusion, the reviewer should say this, that the information which is given, even though incomplete, may be relied upon as being more or less accurate. The editors and collaborators are all men of eminence and prominence in their respective professions.

H. K.

PHILADELPHIA COLLEGE OF PHARMACY.

MINUTES OF THE QUARTERLY MEETING.

The quarterly meeting of the Philadelphia College of Pharmacy was held December 26, 1916, at 4.15 P.M. in the Library, the president, Howard B. French, presiding. Fourteen members were present. The minutes of the semi-annual meeting, held September 25, were read and approved. The minutes of the board of trustees for September, October, and November were read by the registrar, J. S. Beetem, and approved. Professor Kraemer in commenting on the minutes of the board of trustees said the board was to be commended for the large amount of important business transacted during the past three months. The president expressed his appreciation for the remarks of Professor Kraemer.

The secretary read the report of the joint committee of the board of trustees and the Alumni Association on the celebration of the Fiftieth Anniversary of the Alumni Association. The report was prepared by Professor E. F. Cook, chairman of the committee on exhibition, and gave a detailed description of the various exhibits and the names of many of the exhibitors. A report on the exhibition prepared by Dr. R. P. Fischelis was published in the *AMERICAN JOURNAL OF PHARMACY*, December, 1916, pages 529-541.

The president announced the death of Martin I. Wilbert on November 25, who was a member of the college since 1893. On motion it was voted that a committee of three be appointed to draft suitable resolutions to his memory. The president appointed H. K. Mulford, Joseph P. Remington and Dr. F. E. Stewart.

The resignation of William A. Carpenter, an active member, because of impaired health, was presented and accepted.

Dr. A. W. Miller for the committee on the relief of Belgian Pharmacists asked for instructions as to the disposition of the funds in the hands of the treasurer. After some discussion it was voted that the funds on hand be transmitted to the Netherlands Pharmaceutical Society to be distributed as needed.

Professor Remington announced that our fellow member L. L. Walton had been reappointed to the Pennsylvania Board of Pharmacy, and thought a record of the appointment should be made in the minutes of the college.

Dr. F. E. Stewart proposed that an invitation be extended to the

graduates of the Philadelphia College of Pharmacy and of the department of pharmacy of the Medico-Chirurgical College to unite with the college and participate in its transactions, when, on motion, it was voted that the matter be referred to the committee on membership.

Mr. George M. Beringer donated to the college an opium pipe. The thanks of the college were tendered the donor.

Professor Kraemer on behalf of Mr. George L. Carnan of the class of 1885 presented a very old lignum vitæ mortar. The thanks of the college was tendered the donor.

Professor Kraemer on behalf of Mr. Henry C. Blair presented a large reproduction of the historic drug store at 800 Walnut street. The painting was made in 1835 before the days of photography. In a descriptive letter accompanying the picture it is stated the building was erected in 1812 and with the exception of a change in the bulk windows the building is practically the same now as it was when first built. The outside sign of "Pharmaceutist" is believed to be the first of its kind in this country. There were also presented on behalf of Mr. Blair the matriculation tickets of three generations of Blairs. These interesting historic relics were accepted and the thanks of the college tendered our fellow member, Mr. H. C. Blair.

The president made the following appointments:

Committee on Legislation: Theodore Campbell, chairman; Joseph P. Remington, W. L. Cliffe, Samuel C. Henry, Warren H. Poley and R. H. Lackey.

Committee on Membership: Joseph W. England, chairman; R. H. Lackey, O. W. Osterlund, with the treasurer and secretary ex-officio.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

September 5, 1916. No quorum present, as many members of the board were attending the meeting of the American Pharmaceutical Association, held at Atlantic City.

September 12, 1916. Twelve members were present. Regrets were received from Messrs. Lemberger, Mulford and Shoemaker.

The Committee on Property reported that the college buildings were in good condition; and although it was necessary to make some

repairs and alterations, everything would be ready for the opening day.

The Committee on Finance made a report upon salaries and the mode of payment, which was approved.

The Committee on Scholarships reported that some of the students to whom scholarships had been awarded desired to continue their studies for higher degrees, particularly the B.Sc. degree. After further explanation and discussion, it was voted that "such students may matriculate for other courses leading to degrees, upon the payment of the difference in the fees of the two courses."

On motion it was voted that Louis J. Gershenfeld, P.D., class of 1915, be awarded the Clayton French Fellowship, providing he was able to take up the work as assistant to Professor Roddy.

The Committee on Examinations reported that Paul D. Sands, P.D., had successfully passed all his examination in analytical chemistry and was, therefore, recommended to receive the certificate of proficiency in chemistry. On motion the certificate was awarded.

The Committee on Announcement reported the issue of 1916-17 catalogues and the Bulletins, the latter with an insert relative to the merger with the department of pharmacy of the Medico-Chirurgical College.

The Committee on Commencement reported that the Academy of Music had been leased for Wednesday evening, June 6, 1917, for the commencement exercises of the college.

The amendment to the by-laws presented at a previous meeting was again read and adopted.

A communication was received from George F. Troutman, class of 1892, requesting a duplicate diploma, the original having been destroyed by fire. All the requirements had been complied with and therefore, on motion, the secretary was instructed to have a duplicate diploma prepared.

The Committee on By-Laws offered additional amendments to the by-laws, which were held over for future action.

Committee on Membership reported favorably on the application of Lewis M. Hires for active membership in the college. A ballot was taken and he was unanimously elected.

October 3, 1916. Thirteen members were present. A communication was received from the secretary of the college reporting that Messrs. Edwin M. Boring, Charles Leedom and Theodore Campbell had been reelected to membership in the board of trustees for the ensuing three years.

The Committee on Property recommended that additional insurance to the amount of \$25,000 be placed on the college and also that a new inventory of contents should be made. This recommendation was approved. The Committee on Property further reported that the office for the associate dean and also the lunch room for the convenience of the women students had been completed.

The Committee on Scholarships was given power to act in the award of scholarships. On motion of Mr. French, the Thomas S. Wiegand Scholarship was awarded to Sister Mary Beatrice.

The Committee on Announcement presented the report of Mr. J. R. Graham, the publicity agent, and also his resignation, he having accepted a position in another state. The report was received and the resignation was accepted with regret.

The Committee on Membership reported favorably on the application of Ivor Griffith and Charles L. Liebert, for active membership in the college. A ballot was taken and they were unanimously elected.

November 8, 1916. Thirteen members were present. The amendments to the by-laws proposed at a previous meeting were adopted.

The Committee on Property recommended that 25 steel lockers be added to the accommodations and that some alterations be made in the registrar's office. The committee was given power to act.

The Committee on Library reported that up to date 9,062 books had been accessioned and shelf-listed and 4,569 books catalogued. A number of purchases had been made and some gifts were received. 314 persons used the library during the month.

The Committee on Instruction made a number of recommendations which were considered seriatim.

First. The large class of students enrolled necessitates three additional student assistants in the laboratories. Approved.

Second. To departmentize the faculty into four subdivisions, namely:

The Department of Pharmacy under the direct supervision of Professor Remington, to include Professors Remington, LaWall, Cook, Vanderkleed and instructors, Professor Truesdell, Dr. F. E. Stewart and Mr. Ivor Griffith.

The Department of Chemistry, under the chairmanship of Professor Moerk, to include Professor Moerk, Emeritus Professor Samuel P. Sadtler, Professors Stroup and Sturmer.

The Department of Botany, Pharmacognosy and Materia Medica, under the chairmanship of Professor Kraemer, to include Professor Kraemer, Dr. C. B. Lowe and Dr. P. S. Pittenger.

The Department of Bacteriology, under Dr. J. A. Roddy.

It is intended that the members of these various departments of the college faculty hold frequent conferences to harmonize the instruction in the departments, to outline advances in the courses and to economize the time. Approved.

The Committee on Instruction also recommended postponing the date for advancing the entrance requirements to the completion of two years' high school work, from the beginning of the session of 1917 to the beginning of the session 1918. Approved.

Professor Remington reported the selection of Mr. A. H. Fitzkee, class of 1916, as instructor in operative pharmacy. This was approved.

The Committee on Examinations reported that Harry Lounsbury, P.D., class of 1916, had satisfactorily completed the special course in bacteriology and was entitled to receive the certificate. On motion the certificate was awarded.

The application of Clayton S. Hill, class of 1916, for a duplicate diploma was read (the original diploma having been damaged). As all the requirements had been complied with, the request was granted.

CURRENT LITERATURE.

SYRUP OF TEA.

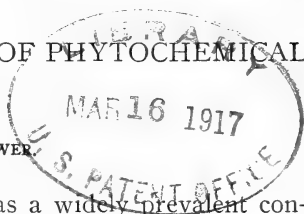
Charles H. and M. R. LaWall (*Proc. Penn. Pharm. Assoc.*, 1916) proceed as follows in making a plain Tea syrup which seems to be permanent and satisfactory: Place 1 lb. of Tea siftings in a glass percolator after moistening slightly with cold water; pack firmly, and pour boiling water over the tea until 64 fl. oz. of percolate have been obtained. Place $7\frac{1}{4}$ lbs. of dry granulated sugar in 1 gallon bottle, add sufficient of the tea infusion to fill the container and dissolve the sugar by agitation, subsequently sterilizing the finished preparation in the customary manner. As it is a little difficult to dissolve the sugar by agitation, the sugar may be dissolved during the sterilization.

THE AMERICAN JOURNAL OF PHARMACY

MARCH, 1917

THE AIMS AND DEVELOPMENTS OF PHYTOCHEMICAL RESEARCH.¹

BY FREDERICK B. POWER.



It is not very long ago since there was a widely prevalent conception, which apparently to some extent still exists, that the chemical examination of plants is a comparatively simple procedure, requiring for its accomplishment neither very broad chemical knowledge nor a high degree of manipulative skill. This view is doubtless to be attributed to the fact that in past years many so-called proximate analyses of plants have been conducted which consisted of but little more than the extraction of a small amount of some vegetable material with various solvents, and subjecting the products to a superficial examination. In this way it has been possible for those possessing but little chemical training to record the occurrence of such widely distributed classes of organic compounds as volatile and fatty oils, resins, sugar, tannin, and the simpler organic acids, while the larger proportion of undetermined material was, as a rule, quite conveniently designated as extractive matter. To such observations may have been added an occasional indication of the presence of an alkaloid or a glucoside.

It is not by any means my intention to deprecate or discourage such simple determinations as those to which I have alluded, provided they be accurately and intelligently conducted, for in the investigation of any vegetable material certain preliminary tests are desirable and important, both in order to obtain some general information respecting its character and for the purpose of ascertain-

¹ An address delivered before the Washington Chemical Society, November 23, 1916, and approved for publication by the Secretary of Agriculture.

ing the presence or absence of a particular compound. On the other hand, it is evident that the chemical examination of a plant should not be restricted to such narrow limits. A very much more extended and detailed study is in fact required if any contribution of value is to be made to the more exact knowledge of the constituents of plants or drugs, for no field of research can be considered to demand a more intimate acquaintance with the properties and behavior of organic compounds, or, in general, to afford a wider scope for the application of chemical knowledge and skill, than that of phytochemistry.

In contrast to the qualifications I have indicated, it will be found that much of the earlier literature pertaining to the chemical examination of plants is extremely superficial in character, and it is thus apparent that such investigations have frequently been attempted by those who were quite inadequately prepared for the task. The results obtained under such conditions are naturally of limited value, and are sometimes quite misleading. It is probably for this reason that the subject of phytochemistry appears hitherto not to have received its full measure of recognition, although it must also be considered that the application of newly developed methods and the general extension of scientific knowledge have been important factors in the achievement of such results as have attended the more recent endeavors in this field of investigation.

The subject of phytochemistry in its broadest sense may evidently be considered to comprise the application of chemical science to all conditions affecting the cultivation and growth of plants, as well as a knowledge of their constituents. It would thus be concerned, among other things, with the character and composition of the soil, the selection of suitable fertilizing material, the study of such questions as the influence of radioactive ores and residues on plant life, and also the conditions under which the economically important constituents of the plant are produced in the largest amount. As an example of the latter purpose, with which botanical knowledge and skill must naturally be associated, it may suffice to mention the efforts to increase the yield of a particular alkaloid, such as quinine from cinchona barks, or to promote the development of such other important compounds of diverse character as are afforded by various plants. In this connection it may be noted that one of the largest and most attractive fields of chemical investigation still remains practically unexplored, for comparatively little is as yet known respecting the constituents of the plants which inhabit North America, or even

those of our immediate surroundings. There can be no doubt that a careful and complete examination of this material would reveal not only much of scientific interest, but also a considerable number of substances which would be found to possess medicinal value.

The numerous applications of phytochemistry, to some of which I have briefly alluded, render it evident that it represents an important part of agricultural science. In surveying this large domain it has been deemed desirable to devote the time this evening to a consideration of the chemical characters of some plant constituents, and for the elucidation of this phase of the subject a brief account may be given of some results obtained in the course of investigations with which I have been personally associated.

Among the drugs which possess not only chemical interest, but very considerable medicinal importance, may be mentioned the so-called chaulmoogra seeds, or the fatty oil obtained therefrom.

Chaulmoogra Oil was for a long time considered to be obtained from the seeds of *Gynocardia odorata* R. Br., but chiefly through the researches of Sir David Prain, Director of the Royal Botanic Gardens at Kew, it was definitely ascertained that the seeds yielding this oil are those of the plant *Taraktogenos Kurzii* King, or, as designated by some botanists, *Hydnocarpus Kurzii* Warburg, which is a native of Burmah.

The chief use of chaulmoogra oil is in the treatment of leprosy and other skin diseases, for which it is employed both internally and externally. It is the remedy most relied upon for leprosy, and by some is regarded as a specific for that disease.

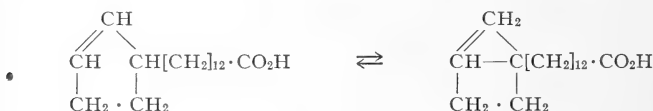
Chaulmoogra oil was first chemically examined many years ago, when, after hydrolysis, a product was obtained therefrom which received the designation of gynocardic acid, but which is now known to have consisted of an indefinite mixture. On the other hand, the more recent and complete examination of the oil has shown it to possess very exceptional chemical interest.² Its chief constituents are the glyceryl esters, or glycerides, of acids of an entirely new type. These acids are optically active, have a cyclic structure, and are represented by the general formula $C_nH_{2n-4}O_2$. The acid present in the oil in the largest proportion possesses the empirical formula $C_{18}H_{32}O_2$, and has been termed chaulmoogric acid, with reference to its source. For the purpose of classification in the literature, it represents, together with its homologue, the so-called chaulmoogric acid series.

² Power and Gornall, *Jour. Chem. Soc.*, 1904, 85, pp. 838-851.

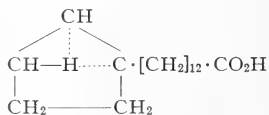
Chaulmoogric acid is a beautifully crystalline substance, melting at 68° , and having an optical rotatory power of $[\alpha]_D +56^{\circ}$. Although isomeric with linolic acid, it combines directly with only two atomic proportions of bromine or iodine, therefore has but one ethylenic linking, and must contain in its structure a closed carbon ring.

Another crystalline acid, which represents a lower homologue of chaulmoogric acid, has also been isolated from chaulmoogra oil. This acid possesses the empirical formula $C_{16}H_{28}O_2$, melts at 60° , and has $[\alpha]_D +68^{\circ}$. It has been termed hydnocarpic acid, on account of having first been obtained from a *Hydnocarpus* oil, to which reference will again be made.

A number of derivatives of both chaulmoogric and hydnocarpic acid have been prepared, and their constitution has been thoroughly elucidated.³ They have been shown to be cyclopentene derivatives, containing an aliphatic side chain, and a consideration of their behavior towards oxidizing agents indicates them to exist in two tautomeric forms. In the case of chaulmoogric acid these two forms may be represented by the following formulæ:



The simplest expression of the constitution of chaulmoogric acid would therefore be by the following formula, in which the dotted lines represent a state of equilibrium between a hydrogen atom and two carbon atoms:



Hydnocarpic acid possesses the same structure as chaulmoogric acid, and differs from it only by containing ten methylene groups in the side chain instead of twelve.

In addition to the two acids already mentioned, chaulmoogra oil has been found to contain a relatively small proportion of palmitic acid or its glyceride, and a phytosterol. The seeds contain, further-

³ Power and Gornall, *Jour. Chem. Soc.*, 1904, 85, pp. 851-861, and Barrow-cliff and Power, *ibid.*, 1907, 91, pp. 557-578.

more, a considerable amount of a substance which yields hydrocyanic acid on hydrolysis, and is evidently a glucoside, but the attempts to isolate this compound have not as yet been successful.

In connection with the investigation of chaulmoogra oil, the oils expressed from two distinct species of *Hydnocarpus* seeds have also been chemically examined,⁴ since they are used in their respective countries for similar purposes. One of these oils was obtained from the seeds of *Hydnocarpus Wightiana* Blume, which is a native of Western India, while the other was obtained from the seeds of *Hydnocarpus anthelmintica* Pierre, which is indigenous to Siam. The last-mentioned seeds are exported to China under the name of "Lukrabo." It may be sufficient to state that the oils obtained from the seeds of these two species of *Hydnocarpus* closely resemble chaulmoogra oil in their physical properties and chemical composition, containing the same crystalline, optically active acids, and therefore doubtless possess identical medicinal value.

Inasmuch as the seeds of *Gynocardia odorata* had for a long time been regarded as the source of chaulmoogra oil, it was deemed desirable to ascertain the character of the oil expressed from them.⁵ For this purpose a quantity of perfectly authentic seeds was specially collected in Sylhet, Assam, since they are not an article of commerce, even in India. The oil from gynocardia seeds is a pale yellow liquid, whereas the true chaulmoogra oil at ordinary temperatures is a soft solid. Gynocardia oil has an odor resembling that of linseed oil, and is optically inactive. In its chemical composition, as well as in its physical properties, it bears no resemblance to chaulmoogra oil, since it contains none of the members of the chaulmoogric acid series. It consists chiefly of the glycerides of the ordinary fatty acids, such as linolic acid or its isomerides of the same series, palmitic acid, linolenic and isolinolenic acids, with a relatively small amount of oleic acid. The results of this chemical investigation thus served to confirm the previous botanical observations, and completely established the fact that the product known as chaulmoogra oil has never been obtained from the seeds of *Gynocardia odorata*.

It has already been noted that genuine chaulmoogra seeds contain a considerable proportion of a compound which yields hydrocyanic acid on hydrolysis, but that the attempts to effect its isola-

⁴ Power and Barrowcliff, *Jour. Chem. Soc.*, 1905, 87, pp. 884-896.

⁵ Power and Barrowcliff, *ibid.*, 1905, 87, pp. 896-900.

tion had not yet been successful. On the other hand, it has been possible to obtain from the seeds of *Gynocardia odorata* a beautifully crystalline, cyanogenetic glucoside, which possesses the empirical formula $C_{13}H_{19}O_9N$, and has been designated gynocardin.⁶ It is accompanied in the seed by an enzyme, termed gynocardase, which readily hydrolyzes β -glucosides.

In connection with the subject under consideration it would appear of interest to refer to an incident in which the results of the investigation of chaulmoogra oil and related products proved to be of very considerable practical value. During the latter part of the year 1910 a number of cases of poisoning occurred in Germany through the use of a margarine which had been brought into commerce under the name of "Backa," and which was stated to have been prepared from a so-called "maratti fat," imported from India.⁷ Legal proceedings were subsequently instituted against the manufacturer of the margarine, and the subject naturally attracted the attention of the health authorities as well as the general public. The investigations which ensued, in which chemists, botanists, and medical men participated, soon revealed the fact that the fat employed in the particular instance for the manufacture of margarine had been obtained from chaulmoogra seed or from the seed of one of the closely related species of *Hydnocarpus*. The identification of the fat was effected, not only by a comparison of its physical properties with those of the products which so short a time previously had been made the subject of extended research, but also by the isolation therefrom of the crystalline, optically active chaulmoogric acid.

Another native product of the East Indies, which is much more familiar through its use as a condiment than as a drug, is the *nutmeg*. It is probably not generally known, however, even among chemists, that the nutmeg when taken in considerable quantity possesses decided narcotic properties. Nevertheless, there have been in past years somewhat frequently recorded cases of so-called nutmeg poisoning, the symptoms of which are stupor and delirium, and alarming, if not fatal, consequences are said to have followed the free use of the drug in both Europe and America, as well as in India. On the other hand, in the quantities ordinarily used as a condiment or flavoring agent, the nutmeg may be regarded as perfectly harmless.

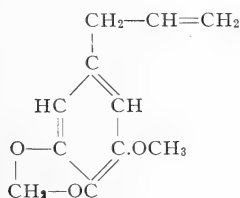
⁶ Power and Lees, *Jour. Chem. Soc.*, 1905, 87, pp. 349-357.

⁷ *Zeitschr. f. Untersuchung der Nahrungs- und Genussmittel*, July, 1911, p. 226, and *Deutsche Med. Wochenschr.*, 1911, p. 53.

A desire to ascertain the nature of the toxic constituent of the nutmeg was the chief incentive to its complete chemical examination, and this yielded results of considerable interest.⁸

Although the nutmeg contains a considerable amount of a fatty oil, the more important product is the essential oil, which has been found to be of very complex composition. This essential oil contains, for example, pinene, camphene, and dipentene, eugenol and *isoeugenol*, linalool, borneol, terpineol and geraniol, safrole and myristicin, $C_{11}H_{12}O_3$. It also contains formic, acetic, butyric, and octoic acids, and an acid of the composition $C_{13}H_{18}O_3$, all in the form of esters, together with myristic acid in a free state, and some minor constituents not here enumerated. The so-called "myristicol" of earlier investigators is now known to have been a mixture of alcohols, which probably consisted chiefly of terpineol.

Physiological experiments have shown that the toxic properties of nutmeg are due to the compound known as myristicin, $C_{11}H_{12}O_3$, which is a 3-methoxy-4:5-methylenedioxy-1-allylbenzene:



This compound is a liquid, possessing only a faintly aromatic odor and a high boiling point, 171–173° at 40 mm. By treatment with metallic sodium or with an alcoholic solution of potassium hydroxide it is converted, through the change of the allyl into a propenyl group, into the handsomely crystalline *isomyristicin*, which melts at 44°.

The chemical interest pertaining to nutmeg is not restricted to the characterization of its constituents, or even to the determination of the physiologically active component, for the primary investigation, as is frequently the case, suggested another line of research which led to results of considerable importance. It was conceived, for example, by my associate in these investigations⁹ that myristicin,

⁸ Power and Salway, *Jour. Chem. Soc.*, 1907, 91, pp. 2037–2058, and 1908, 93, pp. 1653–1659. Also *Amer. Jour. Pharm.*, 1908, 80, pp. 563–580.

⁹ Salway, *Jour. Chem. Soc.*, 1910, 97, pp. 1208–1219.

$C_{11}H_{12}O_3$, might serve as a starting point for the synthesis of cotarnine. As is well known, the base cotarnine, $C_{12}H_{15}O_4N$, is an oxidation product of the opium alkaloid narcotine, $C_{22}H_{23}O_7N$, and under the name of "stypticine" it is used to some extent medicinally. By an extended series of complex reactions it was indeed found possible to pass from myristicin to cotarnine, or, in other words, from a constituent of nutmeg to a derivative of an opium alkaloid. Inasmuch as cotarnine may be combined with meconine, $C_{10}H_{10}O_4$, to form narcotine, and meconine has in turn been synthesized from guaiacol, $C_6H_4\begin{smallmatrix} \text{OCH}_3 \\ \text{OH} \end{smallmatrix}$, the complete synthesis of narcotine has been effected.

It has not been the intention to devote the time this evening exclusively to such vegetable products as are obtained from the Far East, but brief consideration may be given to another Indian plant, on account of both its chemical and physiological interest. The plant in question is known botanically as *Gymnema sylvestre* R. Br., which belongs to the family of *Asclepiadaceæ*, and is indigenous to Banda and the Deccan Peninsula. Although various medicinal properties have been attributed to it by the Hindus, it was brought more prominently to notice some years ago on account of the observation that the leaves, when chewed, have the property of rendering imperceptible the sweet taste of sugar and other saccharine substances, and also, but in a less marked degree, the taste of many bitter substances. This effect is due to a substance which appears to have a selective action upon the nerve fibers or nerve endings concerned with taste, and has been designated gymnemic acid. The most recent investigation¹⁰ of this product has shown, however, that as originally prepared it was not homogeneous,¹¹ and even after extended treatment for the purpose of purification it could not be obtained crystalline, nor in a form which would permit of its more definite characterization.

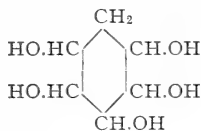
Apart from the constituent of gymnema leaves to which the peculiar physiological property referred to is due, they have been found to contain another substance of chemical interest, namely, a lævorotatory modification of quercitol, $C_6H_7(OH)_5 \cdot H_2O$.¹² The

¹⁰ Power and Tutin, *Pharm. Journ.*, 1904, 73, pp. 234-239.

¹¹ Hooper, *Pharm. Journ.*, 1887, 17, p. 867, and *Chemical News*, 1889, 59, p. 159.

¹² Power and Tutin, *Jour. Chem. Soc.*, 1904, 85, pp. 624-629.

pentahydric alcohol, quercitol, which is a pentahydroxyhexahydro-



benzene, had hitherto only been known in the dextrorotatory form, as obtained from the fruits of various species of *Quercus* and some other sources. This has a specific rotation of $[\alpha]_D + 24.16^\circ$, whereas the new lævorotatory modification has $[\alpha]_D - 73.9^\circ$, and the one cannot therefore be the optical antipode of the other. Inasmuch as quercitol possesses four asymmetrical groupings, a number of stereochemical modifications are possible, and the configuration of the respective dextro and lævo compounds can only be determined when the other isomerides are known.

In any consideration of the subject of phytochemistry it seems eminently desirable that some attention should be given to the plants which are indigenous to the North American Continent, for it may certainly be assumed that they are not lacking in chemical interest. The fact may, however, again be noted that comparatively few of the native plants have as yet been subjected to a complete examination, while the constituents of a large proportion of them are as yet completely unknown. A great wealth of material therefore awaits the investigator in this field of research.

Among the American plants which have been made the subjects of more recent study a few may specially be mentioned which are natives of the Pacific coast, such as *Grindelia camporum* Greene;¹³ *Eriodictyon californicum* Greene,¹⁴ or "Yerba Santa"; *Micromeria chamissonis* Greene,¹⁵ or "Yerba Buena," and the so-called California laurel or mountain laurel, which is known botanically as *Umbellularia californica* Nutt.¹⁶ The last-mentioned plant is of particular interest on account of the character of the essential oil contained in its leaves. This essential oil possesses an odor which at first is agreeably aromatic and somewhat camphoraceous, but when strongly

¹³ Power and Tutin, *Proc. Amer. Pharm. Assoc.*, 53, pp. 192-200, and 1907, 55, pp. 337-344.

¹⁴ Power and Tutin, *ibid.*, 1906, 54, pp. 352-369, and *Jour. Chem. Soc.*, 1907, 91, pp. 887-896.

¹⁵ Power and Salway, *Jour. Amer. Chem. Soc.*, 1908, 30, pp. 251-265.

¹⁶ Power and Lees, *ibid.*, 1904, 85, pp. 629-646.

inhaled it is exceedingly pungent, affecting particularly the mucous membranes of the nose and eyes. A complete examination of the oil has shown it to contain pinene, eugenol, eugenol methyl ether, safrole, and a considerable proportion of cineol, but its chief constituent, and that to which its peculiar pungency is due, is a ketone of the composition $C_{10}H_{14}O$, which has been designated umbellulone.

As an illustration of the chemical interest pertaining to a plant which is quite cosmopolitan in its distribution, the constituents of the common Dandelion, *Taraxacum officinale* Weber, may be briefly considered. The root of this plant, as is well known, is used to a considerable extent medicinally, and, together with extracts prepared therefrom, has long been recognized by most of the national pharmacopœias. A comparatively recent examination of English taraxacum root¹⁷ revealed the presence of a somewhat unexpected number of interesting compounds, some of which had not heretofore been described. It was found to contain, for example, two new, handsomely crystalline, monohydric alcohols, one of which possesses the formula $C_{29}H_{47}.OH$, and has been termed taraxasterol, while the other has the formula $C_{25}H_{39}.OH$, and, being a homologue of the former compound, has been designated homotaraxasterol. Both of these compounds are members of a series, which may be represented by the general formula $C_nH_{2n-10}O$. There was also isolated a small amount of *p*-hydroxyphenylacetic acid, $C_6H_4(OH).CH_2.CO_2H$, which had not previously been observed to occur as such in the vegetable kingdom, and 3:4-dihydroxycinnamic acid, $C_6H_3(OH)_2.CH:CH.CO_2H$, together with a number of the commonly occurring fatty acids, such as oleic, linolic, palmitic, cerotic, and melissic acids. Furthermore, there was found a phytosterol glucoside, a small amount of choline, $C_5H_{15}O_2N$, and a considerable quantity of a sugar, which appeared to consist chiefly of lævulose. When an extract of taraxacum undergoes the so-called mucous or viscous fermentation, it has been observed to contain mannitol, but this does not preëxist in the root. Its formation would appear to be easily explained by the fact that the root of the plant, like other *Compositæ*, contains an abundance of inulin, which, on hydrolysis, is converted into lævulose, and the latter, by the special fermentative process referred to, becomes reduced to mannitol.

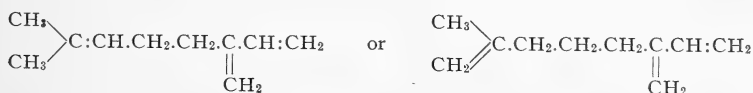
It would appear of interest to note that while the chemical examination of taraxacum was in progress it was recorded in Eng-

¹⁷ Power and Browning, *Jour. Chem. Soc.*, 1912, 101, pp. 2411-2429.

land that the use of an extract of this root in cases of cancer had been attended with beneficial results, and shortly afterwards attention was directed in Germany to the use of choline in the treatment of this disease. Some particular significance would seem to be imparted to these quite independent observations by the fact that taraxacum root has been found to contain choline, but the value of the suggested remedies has apparently not been further confirmed.

It occasionally happens that an investigation may gain in interest, if not in practical importance, through developments in a direction that would at first seem quite divergent from the original subject of inquiry. Some recently published researches by Russian chemists relating to the formation and chemical composition of rubber may serve to illustrate such an occurrence as I have indicated, while also helping to elucidate some problems in plant metabolism. In order, however, that the points of connection between the results of two quite distinct investigations may be more clearly apparent, the purpose and sequence of these investigations should first be explained.

A good many years ago a discussion arose respecting the solubility in alcohol of the oil of bay, as distilled from the leaves of *Myrica acris* DC., it having been stated by the Pharmacopœia that the oil was soluble in an equal weight of alcohol, whereas it was contended by some observers that it yielded a turbid solution, and consequently that the official statement was incorrect. Subsequent observations had shown that the freshly distilled oil usually yields a perfectly clear solution with 90 per cent. alcohol, but that when the oil has been kept for some time its solubility becomes impaired. In order to ascertain the cause of this change, the oil was submitted to a complete chemical examination.¹⁸ One of the most important results was the isolation of a so-called olefinic terpene, an open chain hydrocarbon of the composition $C_{10}H_{16}$, whose constitution may probably be expressed by one of the following formulæ:



This compound, which possesses a density lower than that of the ordinary terpenes, and contains three ethylenic linkings, was the first known representative of its class, and has been designated *myrcene*. On hydration, an alcohol was produced which possessed the odor of linalool, and this on oxidation yielded citral.

¹⁸ Power and Kleber, *Pharm. Rundschau* (New York), 1895, 13, p. 60.

Myrcene is very susceptible to change, becoming readily polymerized by distillation under ordinary pressure or on exposure for some time to the air, with the formation of a viscid product which is very sparingly soluble in alcohol. The isolation of myrcene was not only of considerable scientific interest, but a consideration of its characters, especially its tendency to polymerize, also served to explain the apparent discrepancies of statement respecting the solubility in alcohol of oil of bay.

The more recent researches in another direction, to which I have already referred, may now be briefly considered, since they would seem to impart added interest and significance to the observed occurrence in nature of an olefinic terpene. It is well known that the hydrocarbon isoprene, C_5H_8 , or $CH_2:C(CH_3).CH:CH_2$, when treated with suitable reagents, becomes polymerized, with the formation of a product having the general characters of caoutchouc or rubber, and the various processes for the production of synthetic rubber have been, in fact, chiefly based upon the utilization of this hydrocarbon. It has, however, recently been asserted¹⁹ that all the polymerides of isoprene thusfar obtained differ from natural Para caoutchouc, inasmuch as the decomposition of their diozonides with water yields acetonylacetone and succinic acid in addition to lævulinic aldehyde and lævulinic acid. No succinic acid or acetonylacetone could be detected in the products of hydrolysis of the diozonides from natural caoutchouc. The correctness of these observations is apparently confirmed by the results of some further, quite independent investigations, which, together with the deductions from them, are of particular interest. It has been found, for example, by Russian chemists²⁰ that when isoprene is cautiously heated at a temperature of 80 to 90° C. it yields an open chain hydrocarbon of the composition $C_{10}H_{16}$, which contains three ethylenic linkings, and resembles the myrcene obtained from oil of bay. This new hydrocarbon has been designated by its discoverers as β -myrcene, and its most probable constitution is considered by them to be:



It is a colorless, mobile liquid, boiling at 63° C. at 20 mm. pressure,

¹⁹ Steimmig, *Ber. d. deutsch. chem. Ges.*, 1914, 47, pp. 350-354.

²⁰ Ostromyslenski and Koschelev, *Jour. Russ. Phys.-Chem. Soc.*, 1915, 47, pp. 1928-1931.

and is soluble in all the ordinary organic solvents. When heated at 60-70° C. with metallic sodium and barium peroxide, it is converted quantitatively into normal isoprene-caoutchouc, whereas under similar conditions isoprene gives an abnormal caoutchouc. It has thus been considered by one of the investigators²¹ that this polymerization of chemically pure β -myrcene may possibly represent the only synthesis of natural caoutchouc, that is, of a substance perfectly identical with natural Para caoutchouc, both in the general structure of its nucleus and also in the position of the methyl groups and double linkings of the molecule. In this connection it has been remarked that there is every reason to believe that tropical plants synthesize caoutchouc by means of β -myrcene or myrcene-like hydrocarbons or their dimerides, and not by the polymerization of isoprene. The view has furthermore been expressed that, inasmuch as compounds with an atomic grouping like that of myrcene, such as geraniol, linalool, nerol, etc., are of frequent occurrence in plants, the simple dehydration of these unsaturated alcohols would lead immediately to the corresponding myrcenes.

With consideration of the observations to which I have just referred, it would appear to be of some interest to ascertain whether myrcene or an analogous hydrocarbon is contained in plants yielding rubber. If fresh material were available, experiments in this direction could very easily be conducted.

The few examples that have been given of recent phytochemical investigations, although fragmentary in character, may serve in some measure to illustrate their development and scope. It has naturally not been possible in the short space of time to give adequate consideration to the large number of important researches which in recent years have been conducted by various other workers in this field of science. Among these there may specially be noted the contributions to the knowledge of chlorophyll and the coloring matter of flowers, and also those pertaining to the compounds which impart to flowers their fragrance. On the other hand it will doubtless be conceded that no very extended account of phytochemical investigations would be necessary in order to demonstrate their utility, for an enumeration of even a few of the organic plant constituents which have long been known and largely used, either in medicine or the arts, would alone afford sufficient evidence of the lasting benefit which such investigations may confer on mankind.

²¹ Ostromyslenski, *ibid.*, pp. 1941-1947.

Although dependence must still be placed upon natural sources for many invaluable medicinal agents, such as morphine, quinine, strychnine, and other familiar representatives of the group of alkaloids, in several instances the determination of the ultimate constitution of important vegetable compounds has made it possible to prepare them synthetically, thus frequently giving rise to large and prosperous branches of industry. In briefly citing a few well-known examples of such achievements, it may be mentioned that synthetic methyl salicylate, although first produced on a manufacturing scale but a comparatively few years ago, has now displaced to a large extent the natural oils of wintergreen and sweet birch, of which it forms the chief constituent, while the salicylic acid employed in the process of manufacture is also an artificial product. Vanillin and coumarin, which represent the aromatic principles of the vanilla bean and tonka bean respectively, are now rarely obtained from these natural sources, but almost entirely by synthetic methods. Artificial indigo is now produced to the extent of several million pounds per annum, and is actively competing with the natural product, but for various reasons it has not completely displaced it. On the other hand, alizarin has long since ceased to be obtained from the root of *Rubia tinctoria* L., or Dyers' madder, being now prepared from anthracene, a constituent of coal tar.

It will be evident from the brief account of recent phytochemical research that I have now been able to present that it is not restricted in its scope to the isolation of definite organic compounds and their characterization, although this may be considered of primary importance. Its higher aim would be to determine the constitution of these compounds, and, if possible, the means for their synthetic production. A wide and most attractive field of scientific investigation is thus afforded, in which the opportunities for development are practically unlimited.

In conclusion, the hope may be expressed that the newly established phytochemical laboratory of the Bureau of Chemistry may render useful service, both in promoting the knowledge of plant constituents and in extending the applications of the knowledge pertaining thereto.

PHYTOCHEMICAL LABORATORY,
BUREAU OF CHEMISTRY.

ASSAY PROCESSES OF THE U. S. P. IX.¹

BY PHILIP ASHER, PH.G., M.D.

About ten days ago, when requested by the chairman of your program committee to read a paper at this meeting in lieu of the appointed speaker, who found that he would not be able to have his subject ready for the occasion, I little realized what it meant to prepare a paper of this magnitude upon such short notice. Nevertheless I have prepared a few observations relating to the assay processes of the new U. S. P. Owing to the short time at my disposal, your indulgence is asked for any omissions that may occur in this paper. Before taking up the subject of the evening, a few remarks will be apropos concerning the Pure Food and Drugs Act, and also Pharmacy.

It may not be generally known that the Pure Food and Drugs Act owes its existence to the efforts of the energetic members of the American Pharmaceutical Association. In 1901 a committee of the American Pharmaceutical Association reported that the government had established a pharmaceutical laboratory in connection with the Department of Agriculture. From that time until the final passage of the bill which has placed this law among the national statutes, the A. Ph. A. has been persistent in its efforts towards this end. It can be said without fear of gainsay that no legislation has ever been enacted that has done so much good for the conservation of the public health as this law. The people of this country owe much to the American Pharmaceutical Association for its untiring efforts in their behalf. The passage of this law has given rise to the establishment of food and drug laboratories throughout the country and this has resulted in the employment of a large number of chemists.

Pharmacy is not only the mother of medicine, but chemistry owes it a debt as well. Those familiar with the early history of chemistry are well aware that many of the men who have given their best efforts to the development of the science of chemistry had their thoughts in the domain of this science awakened in the simple apothecary shop.

¹ Read before the Louisiana Branch of the American Chemical Society, December 15, 1916.

The processes outlined in this article will show the wide range of chemical knowledge that the pharmacist should possess.

In no school where chemistry is taught, except in those institutions making chemistry a specialty, is the subject of chemistry taken up so fully as it is taught in pharmacy colleges. There is hardly a branch of chemistry that has not some pharmaceutical bearing and it is not surprising then that this subject receives the consideration it does.

U. S. P. ASSAY PROCESSES.

As is well known today, the U. S. Pharmacopœia and the National Formulary are the legal standards for drugs, chemicals and their preparations. The methods of assay given therein must be strictly followed in every instance: this cannot be too strongly emphasized.

In reviewing the assay processes of the new U. S. P. in a general way, one sees that quite a number of changes have taken place, some quite radical. It is almost impossible in the time allotted to the subject to touch upon all the details, so that in a large number of instances a generalization of the methods will alone be considered; but where any general method offers any special features, these will be taken up at greater length.

There have been several errors observed in the quantities given under some of the assays, so that the writer does not wish it understood that the amounts given have been verified. It had been his intention to have done so had he had sufficient time to complete this paper in the time originally allotted to him.

For example, under potassium chlorate the quantity of acidulated ferrous sulphate is insufficient. The amount of iron sulphate is only .750 Gm., whereas the quantity required for the oxidation by .1 Gm. potassium chlorate is 1.400 Gms. Again on page 221, under ammoniated mercury, it is directed to multiply the weight of mercuric sulphide found by .162. This is wrong, it should be .862.

ACIDIMETRY AND ALKALIMETRY.

The following acids are assayed by titrating with normal alkali: Acetic, citric, hydrobromic, hypophosphorous, sulphuric, tartaric and trichloroacetic.

Boric acid is also titrated with normal alkali, but glycerin is used with it.

With aromatic sulphuric acid the same method is followed, but it is first refluxed six hours, the object of which is to decompose the ethyl-sulphuric acid of the compound under examination into alcohol and sulphuric acid, and thereby obtain its full acid content.

In the assay of phosphoric acid and phosphates a departure from the general method is resorted to. About 1 Gm. of the acid is accurately weighed and diluted with water to make 100 mls; 10 mls of this solution are transferred to a 100 ml flask and neutralized with special KOH T.S. (one free from chlorides), phenolphthalein being used as an indicator. To the solution 50 mls $n/10$ silver nitrate are added and then zinc oxide, free from chloride, is added in small portions to neutralize the liquid. Sufficient distilled water is added to make exactly 100 mls, and the whole agitated. The mixture is filtered through a dry filter, and to 50 mls of the filtrate 2 mls of nitric acid and 2 mls iron and ammonium sulphate T.S. are added, and the excess of silver used is titrated with $n/10$ KCNS.

In the old U. S. P., lactic acid was assayed with normal KOH, in the cold. The new directions are that after the addition of the alkali, the solution be boiled 20 minutes. This is to convert the lactones, or inner anhydrides, into the lactate. The purity rubric of the old U. S. P. was 75 per cent. By the new method a strength of 85 per cent. results, including both the lactic acid and its anhydrides.

In the assay of benzoic and salicylic acids, $n/10$ barium hydroxide is substituted for the KOH, phenolphthalein being used as an indicator. The end reaction with alkali hydroxide is not sharp, owing to the carbonate it usually contains and because the titration is conducted in the cold. Barium hydroxide has been substituted to overcome this.

There are several salts of the pharmacopœia that are assayed by acidimetry or alkalimetry: by direct titration without intermediate steps. Under the acidimetric method is potassium bitartrate. Under the alkalimetric method are the following: ammonium carbonate and hydroxide; potassium hydroxide, bicarbonate and carbonate; magnesium oxide, carbonate and hydroxide; sodium borate, carbonate, hydroxide, cacodylate and glycerophosphate; zinc stearate, carbonate and oxide.

With compounds such as zinc stearate the process slightly varies. They are first boiled with an excess of $n/10$ sulphuric acid, which

breaks up the compound into the acid and the sulphate. The excess of acid used is then titrated with $n/10$ KOH.

The direct titration of borax, sodium cacodylate, sodium glycerophosphate and others of this class, by $n/2$ HCl depends upon the property of the liberated acids from these compounds being indifferent to methyl orange. The compounds are ionized in the solution, and only the bases respond to the indicator.

In the assay of chloral hydrates, the compound is first treated with an excess of normal KOH. This converts the chloral into chloroform and potassium formate, according to the following equation:



The excess of alkali is then titrated with normal sulphuric acid.

Several of the compounds, such as formaldehyde and paraformaldehyde, are assayed under the acidimetric method, after having been first oxidized by peroxide of hydrogen. The compound to be assayed is treated with alkali, then with hydrogen peroxide, after which the excess of alkali used is determined by titration with sulphuric acid, litmus being used as the indicator.

Only one of the compounds of the U. S. P. is assayed by distillation, solution of ammonium acetate. The assay is carried out by adding an excess of alkali to the solution. The mixture is heated and the ammonia is distilled into a known quantity of normal sulphuric acid. The excess of acid used is determined by titration with alkali.

Metallic organic salts are directed to be assayed by first carbonizing the salt. By this process, the compound is converted into its carbonate. The cooled mass is disintegrated; the crucible and mass are transferred to a beaker. Fifty mls each of water and half-normal acid are added and the beaker covered with a watch crystal and boiled for thirty minutes. The solution is filtered and the residue washed until no longer acid to litmus. The excess of acid is titrated with alkali, with methyl orange as an indicator. The following salts are assayed by this method: calcium lactate, lithium citrate, potassium acetate, citrate, potassium and sodium tartrate, Seidlitz powder, sodium acetate, benzoate, citrate, salicylate, and strontium salicylate.

With volatile organic salts, such as ammonium benzoate and salicylate, the above method would not apply. The method used for these salts is as follows: To .5 gram of the salt, dissolved in 10 mls of water, are added 5 mls of diluted sulphuric acid. The liberated organic acids are then extracted with successive portions of 25, 15 and 10 mls of chloroform. The chloroform solution is evaporated spontaneously, 25 mls of neutral alcohol are added, and the solution titrated with $n/10$ barium hydroxide.

GRAVIMETRIC METHODS.

There are quite a number of purely gravimetric methods in the U. S. P. processes. They may be divided into four classes: First, decomposition directly by heat into definite compounds, admitting of weighing and determination; secondly, precipitation; thirdly, precipitation and further decomposition of the precipitate by heat; fourthly, miscellaneous.

The following substances are assayed by the first method: calcium glycerophosphate and all the official bismuth compounds, consisting of bismuth and ammonium citrate, betanaphtholate, hydroxide, subcarbonate, subgallate, subsalicylate, and the subnitrate.

The inorganic bismuth compounds are simply incinerated; but in the case of the organic bismuth compounds nitric acid is added to completely destroy any remaining carbon, the solution evaporated to dryness and ignited, and calculated as Bi_2O_3 . Under bismuth betanaphtholate, a method is also given to determine the amount of betanaphthol present, as follows: To the salt, 10 mls of HCl are added, and the betanaphthol is extracted by successive portions of chloroform. The chloroform solution is evaporated. The residue should not weigh less than 15 per cent. of the salt taken.

Calcium glycerophosphate is assayed by dissolving in water, adding acetic acid, and then ammonium oxalate. The calcium oxalate is washed, dried and ignited, and from the weight of calcium oxide found, the glycerophosphate is calculated.

The second gravimetric method of assay, precipitation, is used for the following: ammoniated mercury and bichloride. For example, .5 Gm. of mercuric chloride is dissolved in water and acidulated with HCl , and completely precipitated by H_2S . The precipitate is filtered upon counterpoised filters and washed, first with water, then with three portions of 10 mls of alcohol. The funnel is closed with a stopper, and to remove any adhering sulphur suffi-

cient carbon tetrachloride is added to cover the precipitate. After an hour the precipitate is drained and further washed with carbon tetrachloride until the filtrate upon evaporation no longer shows any visible residue. It is further washed with alcohol, dried and weighed. The mercuric sulphide found multiplied by 1.167 gives the mercuric chloride.

The third method of gravimetric assay, precipitation and further decomposition of the precipitate by heat, is used in the following: alum, gold and sodium chloride, zinc acetate, sulphate, phenol-sulphonate and valerate.

Alum is determined by precipitation as hydroxide, igniting, and weighing as oxide.

Gold and sodium chloride is assayed by the addition of KOH in excess. The potassium meta-aurate, KAuO_2 , formed is reduced to metallic gold by the addition of peroxide of hydrogen. The precipitate is filtered, washed and ignited.

The zinc compounds are dissolved in water made slightly alkaline with ammonia water, and then precipitated as sulphide by the addition of ammonium sulphide. The precipitate, after washing, is dissolved in nitric acid, the solution evaporated, the residue ignited, and weighed as oxide.

Miscellaneous gravimetric methods of assay are used for sulphur, magnesium citrate and sulphate, and uranium nitrate.

To assay sulphur, 1 Gm. of sulphur is added to 50 mls of 10 per cent. NaOH. The resultant solution of sodium sulphide is boiled, cooled and made up to 250 mls with water. 25 mls of the above solution is oxidized by the addition of hydrogen peroxide, and heated. HCl and BaCl_2 are then added, and from the precipitated BaSO_4 , after washing and igniting, the amount of sulphur is calculated. With this method a blank is run, using the same quantity of solution, but omitting the sulphur.

The solution of magnesium citrate is first evaporated to dryness, then carbonized, and the carbonized mass treated with HCl. To the well-washed filtrate, sodium phosphate is added and ammonium water, and the precipitated magnesium ammonium phosphate, after washing and drying, is ignited, and from the magnesium pyrophosphate obtained the citrate is determined. Magnesium sulphate is also determined in a similar manner. In this case carbonization is unnecessary.

Uranium nitrate. The salt is dissolved in water, and to the

heated solution ammonia water is added until precipitation is complete. After washing with ammonium nitrate solution, it is dried and gently ignited, and weighed as urano-uranic oxide, U_3O_8 .

VOLATILE OILS.

The methods of ascertaining the purities of the volatile oils of the U. S. P., other than methods for determining their physical constants, such as polariscopic, refractometric and gravity methods, may be divided into several groups: Saponification, for the determination of esters and phenols; acetylation, for determining the alcohols; treatment with phenylhydrazine, for aldehydes; and solution in sodium sulphite.

With oil of peppermint, two distinct assays are carried out. First, for the amount of ester, and secondly, for the menthol. The ester of oil of peppermint is menthyl acetate, $C_{10}H_{19}C_2H_3O_2$, of which not less than five per cent. should be present. The assay is carried out as follows: 10 mls of the oil, the exact weight of which has been found, are treated with 25 mls of half-normal alcoholic KOH, and refluxed for one hour. After cooling, the excess of alkali is titrated with $n/2$ sulphuric acid, and the number of mls of alkali used multiplied by 9.909, and divided by the weight of oil taken, gives the percentage of ester. For menthol: The official requirements are that it should contain 50 per cent. total menthol free and as ester. 10 mls of the oil are introduced into an acetylation flask, to which are added 10 mls of acetic anhydride and about 1 Gm. anhydrous sodium acetate. This is heated for one hour, allowed to cool, and the acetylated oil washed with water and solution sodium carbonate, until the washing is slightly alkaline to phenolphthalein. The oil is then dried by adding calcium chloride, filtered, and 5 mls of it, after weighing, are placed in a flask, 50 mls of half-normal alkali added, and refluxed one hour. After cooling, the residual alkali is titrated with half-normal sulphuric acid, and from the following formula the percentage of menthol is calculated.

$$\text{Percentage of menthol} = \frac{A \times 7.808}{B - (A \times .021)}.$$

A represents the number of mls half-normal alkali used in the saponification. 7.808 is 100 times the amount of menthol corresponding to each mil of half-normal KOH, the molecular weight

of menthol being 156.16. *B* represents the weight of acetylated oil used. But as the calculation must be made upon the basis of menthol, the difference between the molecular weights of menthyl acetate and menthol must be subtracted from it for each mil of KOH consumed.

Menthyl acetate is $C_{10}H_{19}C_2H_3O_2$	M. W. 198.18
Menthol is $C_{10}H_{19}OH$	M. W. 156.16
The difference between the molecular weights is	42.02

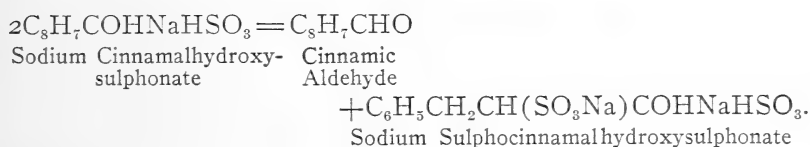
In the saponification of the ester one molecule of menthyl acetate requires one molecule of KOH. If calculated upon the basis of half-normal alkali 2,000 mils would be required. Dividing this difference of molecular weights, 42.02, by 2,000 a quotient of .021 is obtained, and this is the coefficient for each mil half-normal alkali consumed.

Oil of rosemary and sandalwood are assayed by the same method. The changes in calculation are $A \times 7.707$ for the former and $A \times 11.11$ for the latter. The ester of rosemary is bornyl acetate, $C_{10}H_{17}C_2H_3O_2$ (M. W. 196.16), of which not less than 2 per cent. must be present. The alcohol is borneol, $C_{10}H_{17}OH$ (M. W. 154.14), of which the oil should contain not less than 10 per cent. of total borneol.

Oil of sandalwood should contain not less than 90 per cent. of the alcohols calculated as santalol, $C_{15}H_{25}OH$ (M. W. 222.2).

Two of the volatile oils, caraway and cinnamon, are assayed by the sulphite method, depending upon the property that one of the principles is soluble in sodium sulphite solution and the other insoluble. *Oil of caraway*. 10 mils of the oil are placed in a cassia flask, and 50 mils of neutral saturated sodium sulphite solution are added. The mixture is heated on a water bath, and the flask is repeatedly shaken, and the mixture neutralized by additions of dilute acetic acid. When cool, sufficient solution of sodium sulphite is added to raise the lower limit of the oil within the graduated portion of the flask. The decrease in volume subtracted from the volume originally taken will give the value of carvone, $C_{10}H_{14}O$, present; which, when divided by the volume originally taken, gives per cent. by volume of carvone. Carvone is a ketone, isomeric with carvacrol and thymol. Carvacrol and thymol are phenols. In the former, the (OH) is in the ortho position, and in the latter, it is in the meta position.

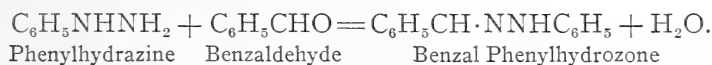
The same method is followed in the assay of oil of cinnamon as with caraway. The requirements are that it should contain not less than eighty per cent. by volume of cinnamic aldehyde, C_9H_8O . In this instance, cinnamic aldehyde forms with the acid sodium sulphite an additive compound, formerly called sodium bisulphite cinnamic aldehyde or, as it is now called, sodium cinnamalhydroxysulphonate. $C_6H_5 \cdot CH : CH \cdot CHO + NaHSO_3 = C_6H_5CH : CH \cdot CHO \cdot NaHSO_3$. Under the influence of water, the additive compound splits up into cinnamic aldehyde and sodium sulphocinnamalhydroxysulphonate.



This latter compound is soluble in excess of sodium bisulphide.

With some oils, like bitter almond and lemon, the sulphite method does not give satisfactory results. In the new U. S. P. these oils are tested by the phenyl hydrazine method.

Oil of bitter almond. About 3 Gm. of freshly re-distilled phenylhydrazine is dissolved in 60 mls alcohol, and 25 mls of this solution is titrated with half-normal hydrochloric acid. To about 1 Gm. of oil accurately weighed 25 mls of the above solution is added and allowed to stand one hour, to form benzal phenylhydrozone.



One drop of methyl orange is added and an excess of half-normal HCl. The mixture is filtered and washed until it no longer gives an acid reaction to litmus. The excess of HCl is titrated with $n/2$ KOH. Subtracting the number of mls consumed in the former from the amount used in the phenylhydrazine test, and the difference multiplied by .053 gives the benzaldehyde present. In the titration of phenylhydrazine with HCl, phenylhydrazine chloride is formed. When the aldehyde is added to phenylhydrazine, phenylhydrozone is formed.

Oil of bitter almond also contains hydrocyanic acid, and its determination is carried out as follows: To a solution of magnesium sulphate a definite amount of NaOH is added, to form magnesium

hydroxide. Two drops potassium chromate are added, and then sufficient silver nitrate to produce a red tint. To the mixture thus prepared a weighed quantity of the oil to be tested is then added and titrated with $n/10$ silver nitrate.

Oil of lemon. The aldehyde present in this oil is citral, $C_{10}H_{16}O$ (M. W. 152.13), of which it should contain not less than 4 per cent. Its method of assay is similar to that of benzaldehyde, with but slight modifications.

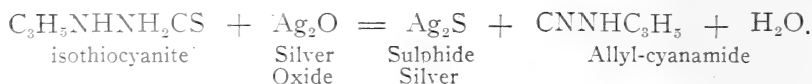
Eugenol, allyl guaiacol, $C_6H_3OCH_3CH_2OH$. Several of the official oils, such as cloves, allspice, etc., contain this principle. The assay is readily carried out by placing 10 mls of the oil in a cassia flask and shaking for 5 minutes, after which it is heated for 10 minutes on a water bath, cooled, the liquid allowed to separate and sufficient KOH added to raise the lower level of the oil within the graduated part of the neck, and noting the volume of residual liquid. The alkali converts the phenol into a soluble sodium compound.

Oil of thyme should contain not less than 20 per cent. by volume of phenol. Its assay is like the above.

Oil of mustard presents a method of assay different from all others. It owes its property to allyl-isothiocyanate, C_3H_5SCN , of which not less than 92 per cent. should be present. 4 mls of the oil, accurately weighed, are diluted with alcohol to make exactly 100 mls. 5 mls of this solution are placed in a 100 mil flask, and 50 mls of $n/10$ silver nitrate are added, and 5 mls of ammonia water. The flask is connected with a reflux condenser and heated for one hour. After cooling, it is made up with water to 100 mls, mixed and filtered. 50 mls of the filtrate, after treating with nitric acid and iron indicator, is titrated with KCNS. The allyl-isothiocyanate is converted by the ammonia into thiosinamine:



The action of the silver oxide produced by adding ammonia water to silver nitrate, removes the sulphur as silver sulphide, with the formation of allyl-cyanamide:



In the assay of oil of eucalyptus another foreign condition is met. This oil contains eucalyptol or cineol, $C_{10}H_{18}O$, of which not less than 70 per cent. by volume shall be present.

The assay directs that 10 mls of the oil be placed in a round-bottom glass dish, imbedded in finely broken ice. 10 mls of arsenic acid T.S. are added and stirred until precipitation is complete. When the mixture ceases to congeal further, it is allowed to stand 10 minutes in the ice bath. Upon the expiration of this time, it is transferred to a hard filter paper and covered with another paper, the whole being surrounded by filter papers and placed between the plates of a press to remove all liquids. When completely dry, the eucalyptol arsenate is transferred to a cassia flask and hot water added, and the flask placed in boiling water. This decomposes the eucalyptol arsenate into eucalyptol. When cool, sufficient water is added to raise the eucalyptol to a level where it can be read.

CHLORIDES, IODIDES AND BROMIDES.

The salts of chlorides, iodides and bromides are similarly determined. The weighed amount is placed in a 200-mil flask and dissolved in 25 mls of water. 50 mls $n/10$ silver nitrate is added, 5 mls of nitric acid, and sufficient water to make 200 mls. Mix and filter. The first 20 mls of the filtrate are rejected. 100 mls of the filtrate, after treating with nitric acid and iron and ammonium sulphate T.S., are titrated with $n/10$ KCNS.

Hydrocyanic acid and sodium cyanide are determined by the silver nitrate method, with potassium iodide as an indicator. To the HCN, KOH is added. The silver nitrate produces the double cyanide of silver and potassium, which is not affected by the alkali. Further addition of silver causes a decomposition, the insoluble silver cyanide separating; the silver cyanide then reacts with the potassium iodide, forming silver iodide, which is shown by the production of a yellow color.

The silver method is also used for the determination of the soluble phosphates and the hypophosphites. The hypophosphites are first oxidized to the phosphates by nitric acid, and the methods then followed as under phosphoric acid.

(To be continued.)

QUARTERLY REVIEW ON THE ADVANCES IN MATERIA MEDICA AND PHARMACY.

BY JOHN K. THUM, PH.G., PHARMACIST AT THE GERMAN HOSPITAL,
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Solution of Magnesium Hypochlorite.—The so-called Carrel or Dakin Solution, which is nothing more or less than the well-known Labarraque solution, considerably modified as to chlorine content, reduced to one fifth available chlorine, in fact, and the alkalinity very much decreased, is regarded by some as too unstable. Some surgeons seem to think that it gives up its chlorine too readily and consequently its antiseptic action is soon spent. To obviate this it has been suggested that a magnesium hypochlorite solution, because of its greater stability, would be eminently more desirable, besides being isotonic with the blood-serum. It is likewise said to be without harm to the cells, and very much less irritating. But it is also suggested that this solution be warmed to 95° F., before using, and that is the great disadvantage. To warm the solution will require great care, and such care is not always possible where many cases are dressed within a certain time, as must be the case in the great war zone, where the demand for antiseptic solutions is urgent and frequent. The use of the Carrel-Dakin Solution is becoming quite general at the present time in this country, and if it has any disadvantages that can be avoided by using another solution, such a solution should be available. The magnesium hypochlorite solution is made as follows:

Chlorinated lime	28.0 gm.
Magnesium sulphate	18.20 gm.
Water	1000.0 mls.

Put the chlorinated lime in a well-covered container with 900 mls of water and stir frequently for 6 hours; dissolve the magnesium sulphate in 100 mls of water; mix both solutions thoroughly and filter rapidly, taking care to conduct the operation with as little exposure to air and light, as possible. Only such quantities should be made as will be used within a short time.

The Property in a Prescription.—While the following interesting case was decided in a London court, yet it will undoubtedly be worth while to bring it to the attention of American pharmacists. In

this country the question "To whom does the prescription belong?" has been a matter of debate since time immemorial. Anything that will in any manner bear on the subject and help to clear it up must be pertinent: "A woman consulted a physician who gave her a prescription which she took to a firm of pharmacists to be dispensed. The prescription was not returned to her, and when her husband asked that it should be, this was refused, the pharmacists stating that they had undertaken at the request of the physician not to return his prescriptions to patients unless they were expressly authorized by him to do so. An action was brought by the husband against the pharmacists for the return of the prescription. In giving evidence, the physician stated that the course adopted by him with regard to prescriptions was taken for the protection of the public. He illustrated the danger of allowing prescriptions to be retained by the patient by saying that not infrequently a medicine ordered for an adult was given, without any physician being consulted, to an infant. He had requested pharmacists to inform him whenever a patient asked for the return of a prescription, and he made a practice of writing on prescriptions which might properly be handed back without question the words "return to patient." The lawyer pointed out that the prescription was of no value to them, and that they were only contesting the case on the question of principle and in order to keep faith with the medical profession. The judge held that no property in the document had passed to the plaintiff, as the prescription had been handed to the patient only in order that it might be conveyed by her to the pharmacists to be made up instead of the medical man himself sending it. The claim, therefore, was dismissed with costs." (*Jour. A. M. A.*, Nov. 25, 1916.)

The Effect of Various Salts and Alkalis on Pepsin.—Hamburger and Halphen make some interesting comments in reference to their experiments with pepsin and the action of salts and alkalis on the same. Pepsin, they state, is completely inactive when treated with salts. Yet they found that sodium chloride in the strength of a 1 to 1,000 solution markedly increases the activity of this ferment, although in a concentration of 1 to 400 solution it seems to have no effect whatever, and a 1 to 40 strength solution renders the ferment completely inactive. They also found that other salts of a neutral character gave similar results. And, as was to be expected, alkalis they found were much more inhibitive. Perhaps the most interesting of their observations is that free hydrochloric acid, in the propor-

tion of 7 to 1,000 up to 9 to 1,000 seems to completely arrest peptic activity. Further work along the last statement of results obtained would be of value. (*Arch. Intern. Med.*, Chem. Abstr., 1916, 10, 2585.)

The Atomic Weight of Lead.—This determination was made from lead oxide prepared from pure lead nitrate, and the result showed that the atomic weight of the metal is 206.98. In 1904, the International Commission adopted 206.9 as the atomic weight. The experimenters also determined the weight of lead extracted from uraniferous minerals. Getting rid as far as possible of any lead which was not of radio-active origin, they found the atomic weight of radio-active lead to be 206.71, which is close to that found by Honigschmidt and Horowitz. (*Compt. rend.*, 1916, 163, 514.)

Fraudulent Drug Traffic Checked.—Fraudulent traffic in imitations of certain synthetic drugs used by physicians has been checked by the joint action of federal, state, and municipal officials, according to the report of the Chief of the Bureau of Chemistry, United States Department of Agriculture. Because of the high prices demanded for such drugs, cheap imitations, with little or none of the therapeutic properties of the genuine, have been put on the market under the names and labels of the real drugs. Shipments were seized, and a number of individuals were prosecuted successfully, under the Federal Food and Drugs Act, and indictments were procured under the postal laws, but the traffic could not be wholly suppressed under the federal laws, nor could all offenders be reached. The department of agriculture thereupon laid the matter before the state and municipal officials, with the result that many prosecutions were instituted and seizures made by them. Ultimately, through joint action, the traffic was suppressed. (*Jour. A. M. A.*, Jan. 13, 1917, p. 130.)

No Importation of "Patent Medicines" Permitted Into Germany.—According to the *Münchener Medizinische Wochenschrift* the Imperial Government has issued an order to the effect that no unnecessary articles will be permitted to be brought into the country, and among other things, this prohibition applies to proprietary medicines. This order applies until further notice. It seems like very gentle irony, indeed, when the country that manufactures more patent medicines than any other, is forced by its government to go on record that this class of products is "unnecessary!" (*Jour. A. M. A.*, Jan. 13, 1917, p. 130.)

The Administration of Deliquescent Drugs in Capsules.—Dr. N. G. Davis, of Chicago, recommends the use of a mixture of one part of beeswax and three parts of castor oil as an excipient for giving salts, such as potassium iodid, sodium or potassium bromid, etc., in capsule. He states that he has given iodine, the element itself, by mixing with every two grains, at least five grains of this wax mass. He also recommends its use for giving guaiacol, oil of sandalwood, and drugs of like similarity. We have found, however, that the wax mass in the proportions of one of beeswax and three of castor oil does not work out. But by reversing the parts it works admirably. (*Jour. A. M. A.*, 1160, 1916.)

Sulpho-Titanic Reagent to Differentiate Alpha and Beta Naphthol.—Titanic anhydride gives marked color reactions with phenolic bodies, a fact known for some time. It has now been discovered that titanic anhydride (native) heated with sulphuric acid at near the boiling point for several hours, and the clear solution decanted, as only a small quantity of the rutile is dissolved, is very useful for identifying alkaloids containing a phenolic group. The reagent is said to be permanent. Morphine gives a blood-red color; apomorphine, a reddish-violet; oxydimorphine, a wine-red; cuprein, an orange shade, something like that of alkali dichromate; hordenine, deep orange; tyrosine, a color something like that given by hordenine; adrenalin, a reddish-brown color. Alkaloids without the phenolic grouping give no reaction. It was also found that this reagent is a particularly sensitive test for the presence of hydrogen peroxide. Furthermore, it was also found that this reagent is an excellent means for differentiating between a- and b-naphthol. A very small quantity shaken in a test tube with two or three mls of this reagent gives forth an intense green color in the case of a-naphthol, and a most decided blood-red color with b-naphthol. If the substance is first dissolved in glacial acetic acid, and the sulpho-titanic reagent is added to the solution, a green ring surmounted by a reddish-violet zone distinguishes a-naphthol; while a blood-red ring indicates b-naphthol. (G. Deniges, *Annales Chim.; Analyst*, 1916, 21, 213.)

Mustard Seed as a Laxative.—Although not generally known, whole mustard seed has been used for many years as a laxative in some countries. In the course of a rather extensive investigation as to why it has this laxative action it was noticed that the odor of hydrogen sulphide had developed in a bottle containing the water in which the seed had been placed the day before. It was reasoned

that the activity of the seed as a laxative is probably due to this generation of hydrogen sulphide and likely to the carbon dioxide which is also formed at the same time, both of which are known to promote peristalsis. The statement is made that this also explains the cyanosis in cases of poisoning by this seed. When this gas is readily eliminated by the lungs there is no untoward action. (*Jour. A. M. A.*, 1916, 1404.)

The Adsorption Theory in Practical Medicine.—The power of aluminum hydroxide and aluminum silicate to adsorb albuminous substances is being made use of in medicine in a practical way in the treatment of the various gastro-intestinal disturbances. In order to be effective it is necessary to give extremely large doses. So far as is yet known no untoward results have occurred, although some observers mention the fact that these drugs show a tendency to form concretions in the bowel and therefore may be the means of more or less obstruction. This power of adsorption exhibited by these drugs resembles in a manner the action of white bole in the treatment of cholera, and likewise the adsorption of toxins from sera. In view of the work done by Lloyd in this country, in connection with hydrous aluminum silicate and its power to separate alkaloids from drugs containing them, it is just possible that many of the pathological conditions produced in the gastro-intestinal tract, for which hydrous aluminum silicate has been used with apparent good effect, may be due to alkaloidal bodies, or bodies closely resembling them. (*J. Russ. Phys. Chem.*, *Chem. Abstr.*, 1916, 10, 2659.)

Rhodoform, a New Dental Antiseptic.—The chemical name of this drug is methylhexamethylenetetramine thiocyanate, and is said to contain 37 per cent. of thiocyanic acid. It is a brown powder, without odor, and melts at 143° C. It is said to be of value as an antiseptic in stomatology. (*Boll. Chim. Farm.*, *Chem. Abstr.*, 1916, 10, 2498.)

Rapidity with which Alcohol and Sugars May Serve as Nutrient.—It is stated that alcohol commences to be burned within five to eleven minutes after taken on an empty stomach. Sucrose, *lævulose*, begins to be burned as soon, and probably sooner. Dextrose and maltose are burned not quite so rapidly, taking at least from twenty to thirty minutes for complete combustion and utilization in the processes of metabolism. It is also stated that *lævulose*, and very often galactose, has a tendency to change into fat in the body. And dextrose tends to change to glycogen, and is stored as such. (*Amer. J. Physiol.*, *Chem. Abstr.*, 1916, 10, 2591.)

Influence of Methyl Salicylate on the Production of Bile.—It has been shown by experimentation on guinea pigs, that methyl salicylate, given either by mouth or hypodermatically, causes an increased secretion of bile, and simultaneously an increase in the total solids of that secretion. A number of experiments on animals on standard diet, and under treatment with this drug, while showing greater output of bile and its products, yet did not show any loss of body weight. (*Jour. A. M. A.*, 1916, p. 1403.)

Chlorosis in Plants.—The author of this interesting paper states that while the commonest form of chlorosis in plants is due to deficiency in iron, this is not the only cause. A lack of manganese, magnesium, or sulphur may bring about the same condition. It is stated that lack of iron is generally due to large amounts of chalk in the soil, which has a tendency to keep back the absorption of iron. Chlorosis induced by a lack of iron is readily cured by the application of a solution of an iron salt to the soil. When caused by a lack of magnesium the condition is not so readily corrected. Chlorosis is also caused by the exudations from diseased plant cells. (*Comptes rend. Soc. biol.*, Chem. Abstr., 1916, 2500 by P. Maze.)

Incompatibility of Sodium Bicarbonate with Bismuth Salicylate, and Magnesium and Lithium Salicylates.—The formation of carbonic acid gas when dispensing a mixture of sodium bicarbonate and bismuth salicylate has been noticed by many workers, therefore this incompatibility is no new thing. It is stated that if a neutral sodium carbonate is used there is no effervescence. The same reactions occur with magnesium and lithium salicylates, and the benzoates have a similar reaction. (*Jour. Pharm. Chim.*, 1916, 353.)

Thromboplastin Solution as a Hæmostatic.—This solution is a very fine suspension of ox-brain in physiological salt solution, preserved with 0.3 per cent. of tricresol. It is said to be of great practical value in hæmorrhage but must be applied to the site of bleeding. It is also claimed to be of great value in cases of true hæmophilia, in fact, stated to be a real specific for this most distressing condition. If this is so, a wonderful discovery has been made, and it should be promptly brought to the attention of all the physicians of the world. (*Jour. A. M. A.*, p. 1717, 1916.)

A Report of the Council on Pharmacy and Chemistry.—We cannot help but feel that the following report from the Council on Pharmacy and Chemistry of the American Medical Association will prove of interest to many pharmacists, and develop a more lively

interest on the part of doctors in learning how to avoid writing for irrational combinations of drugs:

"Glycerophosphate Comp. Ampuls, 1 Cc., Squibb" are claimed to contain, in each, sodium glycerophosphate 0.1 Gm., strychnine cacodylate 0.0005 Gm., and iron cacodylate 0.01 Gm. The Council refused recognition to "Glycerophosphate Comp. Ampuls, 1 Cc., Squibb" because the name did not indicate the potent ingredients and because the administration of a mixture of sodium glycerophosphate, strychnine cacodylate and iron cacodylate is irrational.

The preceding statement was submitted to E. R. Squibb and Sons for consideration. The firm replied:

" . . . we wish to explain that there has been a small demand for this product, no doubt created by other manufacturers. We have filled hitherto this demand as far as it came to us, using the formula regularly supplied for years by other firms.

"The name Glycerophosphate Comp. to cover a product containing sodium glycerophosphate, strychnine cacodylate and iron cacodylate, seemed to us the best that could be devised, under the circumstances. It is absolutely impossible to mention all the ingredients in the name, as it would give an unwieldy title. In passing, we might mention that the U. S. P. and N. F. cover also by the word 'Compound' the potent ingredients in many titles.

"However, the finding of the Council, that the formula here in question is irrational, must determine our action, and we have, in consequence, decided to eliminate Glycerophosphate Comp. Ampuls from our list, dropping the article altogether."

This coöperation in the work of the Council on Pharmacy and Chemistry is gratifying. In passing the Council notes that the foregoing criticism of many Pharmacopœial and National Formulary titles is justified. Many Pharmacopœial preparations have names which are not only nondescriptive but actually misleading. Such are compound powder of glycyrrhiza and compound syrup of figs, both of which owe their activity to senna, and acid camphor mixture and compound mixture of glycyrrhiza, which are essentially opium preparations. If any of these preparations possess therapeutic value their names should be descriptive, as otherwise they violate a fundamental principle in the nomenclature of medicinal substances, a principle for which the Council has contended and which is supported by both the medical and pharmaceutical professions as well as by manufacturers." (*Jour. A. M. A.*, Feb. 3, 1917.)

The Sale of Anhalonium to be Regulated.—The Senate passed a bill, on the 25th of January, to amend the Harrison Narcotic Law so as to include within its provisions anhalonium, also known as mescale or muscale buttons and as pellote. It will be remembered that this plant, of which the dried tops are used, belongs to the Cactaceæ or Cactus Family. Experimentation on animals with this drug has shown it to be a powerful narcotic poison. These narcotic properties closely resemble those of opium.

Anent Aspirin.—The expiration of the patent rights on this drug is being awaited with a great deal of interest by the medical and pharmaceutical world, and, as the following news item from one of the most prominent daily papers of the country suggests, by the laity as well. And well may the laity be interested. The propaganda carried on by the patentee in the newspapers and magazines of this country in bringing this drug to the notice of the laity can have only one effect and that a most pernicious one, namely, the encouragement to self-medication on the part of the public. The news item follows:

"There are promises of lively times in pharmaceutical circles after February 17, when the United States patent on aspirin expires. This patent is held by the Bayer Company, Inc., of New York, the American representative of a German dye and chemical firm, and notice has been served that the company claims the sole right to the name aspirin as a registered trademark even after the patent expires. Legal action is hinted at in case any other concern manufactures a product and attempts to sell it under the name of aspirin.

"The chemical name of aspirin is acetyl salicylic acid. Under the patent laws of this country the Bayer Company has held a monopoly on the product, no matter what name it might be called nor what new and improved process might be used in its manufacture. In other words, during the life of the patent, the United States Government virtually took the position that all acetyl salicylic acid, no matter by whom made, was 'aspirin' and the sole right was vested in the Bayer Company.

"It is no secret that there are numerous American firms ready to go into the aspirin business after next week. What they will call their product is not known, but there certainly is a disposition to use the name of aspirin and invite a test. One company in the Philadelphia district, which has up to this time been perfecting its phenolphthalein manufacture, is about ready to jump in on aspirin,

and it is known that certain interests closely allied to this country are in favor of using the name aspirin.

"The argument is made that aspirin is a name, and not a trademark or brand; that the product was introduced as aspirin, and not as aspirin brand of acetyl salicylic acid, and that a name belongs to the object and not to the inventor of a name. If a battle comes it is likely to be fought out largely on this point, which involves positions denied by the Bayer Company." (*The Philadelphia Public Ledger*, Saturday, Feb. 10, 1917, p. 15.)

CORRESPONDENCE.

PROF. HENRY KRAEMER, Editor,
AMERICAN JOURNAL OF PHARMACY,
Philadelphia, Pa.

Dear Professor Kraemer: The following has been unanimously adopted by the members of the Council on Pharmacy and Chemistry.

W. A. PUCKNER, *Secretary.*

The death of Martin Inventius Wilbert, a member of the Council on Pharmacy and Chemistry of the American Medical Association since its organization, removes one of its most able and loyal members. He was possessed of an intellectuality and a manhood which commanded the attention and respect of the members of both the medical and the pharmaceutical professions. He was fearless, honest and unselfish. He was uncompromising in his denunciation of the evils which beset the practice of medicine and pharmacy, but was never ungracious either with his pen or in his speech. If after due deliberation he was sure that a definite policy should be promulgated to improve the conditions of these professions, he proclaimed his view and conducted a campaign that inevitably received the support and recognition of those best informed. He gave a life of service with never a thought of reward and earned every honor which was bestowed on him. His knowledge of pharmacy was such that he could have obtained prominence in the manufacturing field and with it would have come a large measure of financial reward. But he chose to devote his thoughts and energies to the general good rather than to his own profit. His influence on medicine and pharmacy was unique. The forcefulness of his personality

was equaled only by his modesty and sincerity. His greatest work—one which will be cherished as a part of the history of the American Medical Association—was his devotion to the aims and objects of the Council on Pharmacy and Chemistry and his unselfish and indefatigable labors in its behalf.

We, the members of the Council on Pharmacy and Chemistry of the American Medical Association, mourn the loss of one of our most useful associates, and one whose life may be held up to the younger generation of pharmacists as an example of unselfishness and devotion to high ideals.

PROF. HENRY KRAEMER, Editor,
AMERICAN JOURNAL OF PHARMACY,
Philadelphia, Pa.

Dear Sir: At the request of the Board of Trustees of the German Hospital, of Philadelphia, I am enclosing a copy of the Resolutions on the death of Martin I. Wilbert, adopted by them at their meeting, December 26th, 1916.

Very truly yours,

HENRY F. PAGE,
Medical Superintendent.

MARTIN INVENTIUS WILBERT.

WHEREAS, The board of trustees of the German Hospital have learned with profound sorrow of the death of Dr. Martin I. Wilbert, which occurred on November 25, 1916, at this Hospital.

WHEREAS, The late Dr. Wilbert occupied the position of apothecary in this Institution from 1891 until 1908, and director of the x-ray and photographic department from 1899 to 1908, leaving his labors with us after eighteen years of splendid service to accept a position of wider scope in the Federal Service at Washington; establishing by his signal ability and indefatigable perseverance a unique and enviable reputation in the world of medicine and pharmacy.

Resolved, That the board of trustees of the German Hospital deplore his early death at the age of fifty-one, while still in the prime of his life and activities.

Resolved, That the board of trustees tender to the family of our deceased friend their heartfelt sympathy in the loss which they have sustained.

Resolved, That a copy of this minute be sent to the members of the late Dr. Wilbert's family and that copies of these resolutions be sent to the Journal of the American Medical Association, to the Journal of the American Pharmaceutical Association and the American Journal of Pharmacy.

G. A. SCHWARZ, *President*,

ADOLF HELLWEGE, *Secretary*.

AMERICAN PHARMACEUTICAL ASSOCIATION

Editor, American Journal of Pharmacy: The Board of Canvassers of the American Pharmaceutical Association met Monday evening, December 11th and counted the ballots cast in the annual election. The following have received a plurality of the votes and are elected:

President—Charles Holzhauer, Newark, N. J.

1st Vice President—Alfred R. L. Dohme, Baltimore, Md.

2nd Vice President—Leonard A. Seltzer, Detroit, Mich.

3rd Vice President—Theo. J. Bradley, Boston, Mass.

Members of the Council—Fred. J. Wulling, Minneapolis, Minn.; G. M. Beringer, Camden, N. J.; Thos. F. Main, New York City.

Respectfully,

(Signed) A. D. THORBURN,
FRANCIS E. BIBBINS,
FRANK H. CARTER,
EDWARD W. STUCKY.

FUNERAL SERVICES OF MARTIN I. WILBERT.

Martin Inventius Wilbert died on November 25, 1916, at the German Hospital, Philadelphia. His health had been poor for the last four years, and since childhood he had been affected with a heart lesion. On Saturday morning at 9.15 o'clock he suddenly fell back on his pillow and passed away.

The funeral services were held at the chapel of the Mary J. Drexel Home, Philadelphia. This "Home" is the Motherhouse of the Lutheran Sisters who have charge of the nursing in the German Hospital and with whom Dr. Wilbert worked for so many years while connected with the "Hospital" as chief apothecary and director of the x-ray laboratory. For this reason it seemed peculiarly

fitting that the last sad rites in connection with his passing away should be held here and among the friends who knew him so long and held him in such esteem.

Amid the many floral tributes sent by his many friends and the scientific societies that claimed him as a member, lay our friend and fellow-worker, while the pastor of the "Motherhouse," the Rev. Ernest F. Bachmann, read the simple and impressive Lutheran service for the dead, and spoke eloquently of the many fine qualities of this man. The choir of the chapel, composed of Sisters, closed the services by singing Dr. Wilbert's favorite hymn, "Abide with me."

The honorary pall-bearers were Dr. Henry F. Page, Dr. William T. Shoemaker, Dr. George G. Ross, Dr. A. D. Whiting, Prof. Henry Kraemer, and Mr. John K. Thum.

Among the many who attended the services were Mr. Howard B. French, president of the Philadelphia College of Pharmacy, Prof. J. P. Remington, Prof. S. P. Sadtler, Dr. R. A. Hatcher, of New York; Dr. C. A. Weidemann, Dr. F. A. Stewart, Mr. George M. Beringer, Mr. Edwin M. Boring, Mr. William L. Cliffe, Dr. R. P. Fischelis, Mrs. Charles H. LaWall, Prof. E. G. Eberle, Mr. Ambrose Hunsberger, and from Washington, D. C., there were present the following co-workers of Dr. Wilbert in the hygienic laboratory: Dr. A. M. Stimson, Dr. Carl Voegtlin, Dr. Murray Galt Motter, Dr. George B. Roth, Dr. Albert F. Stevenson, Dr. G. A. Menge; and from the same city Dr. S. L. Hilton. Mrs. John M. Maisch, wife of one of the great leaders of pharmacy now deceased, and a warm friend of Dr. Wilbert, was also present. Dr. Marie L. Bauer was also among the many Philadelphia friends present.

The following is an abstract of the sermon delivered by the Rev. E. F. Bachmann.

When Almighty God summoned from our midst our beloved Dr. Wilbert, a life of exceptional usefulness was brought to its close, prematurely in the opinion of many. Yet, as a recently departed servant of the Lord used to say, "All the ways of God lead to Transfiguration." Let us therefore also in this instance, humbly and with unshaken confidence in God's infinite love and wisdom, bow under His Almighty hand. We whose presence to-day is a tribute of our esteem and love to our departed friend and fellow-worker, are but a small fraction of the host of friends to whom this early close of his career is a distinct loss, both to their personal life and to his profession.

There are some among you who still recall the day when Mr. Wilbert entered upon his duties as the apothecary of the German Hospital just twenty-five years ago. Though still a very young man he combined in a rare measure a scientific mind and an altruistic soul, high idealism and practical common sense, which together with his scholarly attainments and his noble simplicity of character soon gained for him the absolute confidence of the late Mr. John D. Lankenau, the great benefactor of the German Hospital, and the founder of our Mary J. Drexel Home & Philadelphia Motherhouse of Deaconesses. Also the staff of the Hospital soon found every reason to trust his scientific and practical judgment, and our Deaconesses found in him such a staunch friend that to this day they have considered him a member of our Motherhouse-family.

His life was an example and an inspiration to all who were privileged to work with him. Though since his boyhood he never enjoyed robust health, his indomitable will forced his body to serve him to the utmost. He never worked for a salary but always for his ideals, which he sought to make realities in accordance with his life long and oft expressed conviction that the Almighty has placed us in the world for service. His ambition, to contribute at least something to the advancement and the real good of humanity, has in a large measure been attained by him even in the judgment of other leaders in his profession.

It seems providential that he was able to complete a most important task assigned to him by the Department just before he left to seek relief at the German Hospital from the attack to which he succumbed on Saturday morning. That he ended his career at that Institution in which he had begun his professional life, was the fulfillment of a wish repeatedly expressed to his most intimate friends. Though eight years ago he had accepted a call to Washington, where a larger field of usefulness with its corresponding greater influence, offered him the much coveted opportunity to bring his ideals nearer to their realization; and though his ability and his noble character gained for him there many true friends, yet he could never forget his "first love," the German Hospital and the Deaconesses.

His life was an inspiration, but also his end has a peculiar message for us. It came so suddenly that it shocked especially those who had briefly called on him even within his last hour. We all were taken by surprise. He himself, however, had arranged all his affairs

practically down to every detail. He had often said: "I am ready to go at any time;" we have reason to believe that he was ready. Only a few of his intimate friends know that he gave some of his deepest thought to religion, to his relation and his responsibility to God. Here then is an example of real preparedness. If we heed the call for national preparedness against an evil day that may never come, is it reason to neglect preparedness for the inevitable, our last day, when we shall have to render our account to God? There is but one true preparedness, and that is found in Christ, who with out-stretched hands calls us to Himself with the well-known invitation "Come unto me all ye that labor and are heavy laden, and I will give you rest." In Him we find forgiveness of sin, the adoption as children of God and heirs of eternal life. He stands before us full of consolation and triumph when He says: "I am the resurrection and the life; he that believeth in me shall never die." Looking up to Him, our Lord and Saviour, let us go forward in our daily task, conscious of our responsibility to Him and of our ultimate victory in Him, consecrated in utter unselfishness to Him and to His cause which finds one of its best expressions in unselfish service to our fellowmen.

NOTES FROM THE RESEARCH AND BIOLOGICAL LABORATORIES OF E. R. SQUIBB & SONS.

THE PITUITARY BODY IN THERAPEUTICS.

BY H. S. ADAMS.

The investigations which in recent years have built up our present knowledge of the glands of internal secretion have yielded practical results along two important lines. Of these the first is the treatment of diseases finding their origin in an abnormal condition of the gland, involving an excess or a deficiency of secretion. A second and quite as important result has been the discovery that these glands may be the source of substances of tremendous physiological activity, which may be applied to the cure of conditions not definitely associated with a diseased condition of the gland in question. Of this second class the present use of our knowledge of the pituitary body is an eminent example.

It is true that certain diseases are definitely associated with abnormalities of the pituitary, and it is perhaps along these lines that the greatest advances may yet be made. The dependence of growth and the development of sex characteristics on the anterior lobe is well established, as is also the connection between the posterior lobe and normal metabolism. The early stages of acromegaly and of gigantism are definitely associated with a hyperactivity of the gland, while hypopituitarism leads to the syndrome known as *dystrophia adiposogenitalis*. But the picture is extraordinarily complicated. The progress of acromegaly may involve first a hyperplasia and later a destruction of the gland, so that the symptoms of hypersecretion are superseded by quite the opposite ones. A further complication arises in that the symptoms may vary according as the anterior or posterior lobe is mainly involved. Moreover the abnormal functioning of the pituitary is ordinarily associated with a tumor of the gland, so that the symptoms incident to its presence are superimposed upon the pituitary syndrome. Administration of the gland or its preparations has indeed given favorable results in the late stages of acromegaly, as well as in *dystrophia adiposogenitalis*. But it seems certain that along this line the greatest developments must be still to come.

Along another line, however, the pituitary has yielded a product of wide therapeutic interest. If a water extract of the posterior lobe is made, and proteins and other inert material removed, there results a solution of extraordinary physiological activity. It is a powerful stimulant of plain muscle. It affects the blood pressure and heart action. It stimulates the uterus, intestines and bladder, and exercises a definite action on the activity of the kidneys. It is upon these physiological properties that the use of pituitary extract has in the main been based.

Its effect on the heart and the blood vessels renders it valuable in cases of shock and other conditions of low blood pressure. Its use in the shock following operative procedure has been followed by strikingly good results. The improvement in blood pressure and heart action comes into evidence a few minutes after its intramuscular injection. It has the immense advantage that the effect is persistent, lasting as long as from twelve to sixteen hours. Moreover the tendency to reaction when the effect has worn off is but transitory, and the patient has been tided over the most trying period.

Its stimulating action on the uterus was one of the first properties noted, and in obstetrics and gynecology pituitary solution has perhaps found its greatest use. In uterine inertia and in conditions where the rapid termination of labor has become desirable or imperative it has given prompt and effective results. For the control of postpartum hemorrhage it is rapid and certain. It presents over ergot the advantages of stability, of uniformity secured by an adequate physiological assay, and of unquestionable sterility. Like other powerful drugs it is susceptible of abuse, and its use in labor with insufficient indications has been the subject of some criticism. In gynecology it has proved, by virtue of this stimulating action on the uterus muscle, an efficient hemostatic.

The action of pituitary extract on the intestine and bladder muscles seems to increase in proportion as there is atony and paresis present. Consequently its use in the condition of loss of tone and distention which may follow operative procedure has led to extraordinarily good results. Its action under these circumstances has been so prompt and so certain as to appear almost specific.

That pituitary solution exercises an effect on renal function is not to be doubted, and diuresis has been associated both experimentally and in some cases clinically with disturbances of the pituitary. But the evidence to date has curiously enough led to two absolutely opposite theories—one that diabetes insipidus is caused by hyperactivity of the pituitary gland, the other that it results from pituitary insufficiency. However this may be, it is certain that diabetes insipidus reacts readily to the injection of pituitary solution. The output of urine is cut down to an amount approaching normal, and the distressing symptom of thirst altogether relieved. The effect persists for hours, so that two injections a day are ordinarily sufficient. No untoward effects seem to follow its continued use. One can scarcely assume on the basis of this evidence alone that the pituitary gland normally controls renal function, any more than the fact that its extract stimulates the uterus must involve the conclusion that the gland is responsible for normal labor. But the unusual physiological activity of the extract, in these two instances as in others, have made it a therapeutic agent of wide possibilities.

MINNESOTA PHARMACEUTICAL ASSOCIATION.

33D ANNUAL CONVENTION.

BY E. L. NEWCOMB, SECRETARY.

The thirty-third annual convention of the Minnesota Pharmaceutical Association was called to order by President John F. Danek at 10 A.M., Tuesday, February 13. President Danek in a few well-chosen words introduced Governor J. A. A. Burnquist, who gave a stirring patriotic address in welcoming the pharmacists to the capital city.

Mr. Carl W. Brenner, of Stillwater, the newly elected president of the Minnesota Rexall Club, responded to the address of the Governor. Mr. Brenner called particular attention to the efforts which the pharmacists are making to raise the educational standards of pharmacy. He pointed out that the prerequisite legislation which pharmacists were requesting would benefit not only the public but also those who are engaged in the practice of pharmacy. Legislation to prohibit house-to-house distribution of drugs and medicines was approved not only on account of the demoralizing effect of this practice upon the practice of pharmacy, but also because it favors self-medication and the improper use of drugs and medicines by the general public.

Mayor V. R. Irvin on behalf of the citizens of St. Paul extended a cordial welcome to the visiting delegates. The Mayor's address was enlivened by anecdotes and stories which served to impress his hearers with the warmth of his welcome. Max Menzel, of Pipestone, responded to Mayor Irvin, thanking him for his kindly remarks.

RECEPTION OF DELEGATES.

Mr. S. D. Andrews extended greetings from the National Wholesale Druggists' Association and expressed the hope that the convention would be successful in every way. Dean F. J. Wulling, as president of the American Pharmaceutical Association, extended greetings from that organization and expressed the hope that a much larger number of pharmacists would in the very near future affiliate with the American Pharmaceutical Association and derive the benefits therefrom.

Mr. Thomas H. Potts, secretary of the N. A. R. D., extended the fraternal greetings from that association and complimented the association on their having secured so able and capable a speaker as Mr. Eugene Brockmeyer, counsel for the N. A. R. D. At this time Dean Wulling upon the request of the president introduced Professor Henry Kraemer, of Philadelphia, who responded by congratulating the pharmacists of the Northwest upon the progressive stand which they had taken in matters pertaining to pharmacy.

Secretary Newcomb next gave his annual report which, while mainly statistical, dwelt at some length on a number of the activities of the association. Attention was called to the fact that the active membership has increased during recent years to the extent that over sixty per cent. of all the pharmacists of Minnesota now belong to the association. Committee letters sent out from the secretary's office during the last year approximated twenty thousand. In addition to this large amount of committee work, over eleven hundred personal letters were written by the secretary.

A considerable portion of the secretary's report dealt with the conservation of the printed proceedings of the Minnesota and other state associations. The conservation of pharmaceutical journals was also discussed. An exhibit was arranged, consisting of bound volumes of pharmaceutical journals and printed proceedings, all of which are the property of the association and which had been bound at the direction of the executive committee. A total of some four hundred printed annual records were represented by the exhibit. The value of these publications was emphasized, and the report recommended that the association continue to preserve such material. The secretary stated that there were still about five hundred active registered pharmacists in Minnesota who do not belong to the association. A continuation of the membership campaign was urged in order that all active pharmacists might soon be brought into the work of the organization.

Chairman J. P. Jelinek next presented the report of the legislative committee which dealt chiefly with prerequisite and anti-drug peddling legislation. The general subject of legislation to restrict the indiscriminate sale of drugs and medicines was then discussed. The Minnesota prerequisite bill was read at this time and discussed in order that those who were not clear on some of the provisions might be well informed. Those taking part in the discussion were: Fred Klenert, Minneapolis; Secretary Newcomb, A. J. Kline, R. J.

Messing, St. Paul; Professor Henry Kraemer, Philadelphia, and others. The Minnesota Prerequisite Bill, as read, follows:

Minnesota Prerequisite Bill—Senate File No. 378.

A BILL

For an Act, To Amend Section 2330 of the Revised Laws of 1905, As Amended by Chapter 346 Laws 1907, being Section 5032 General Statutes 1913, relating to qualifications entitling Pharmacists to registration.

Be it Enacted by the Legislature of the State of Minnesota:

Section 1. That Section 2330 of the Revised Laws of 1905, As Amended by Chapter 346 Laws 1907, being Section 5032 General Statutes 1913 be amended so as to read as follows:

5032.—To be entitled to examination by the Board as a pharmacist, the applicant shall be at least twenty-one years old, shall have successfully completed the work of two (2) college years, of not less than seven (7) months each, at a college or school of pharmacy which in the judgment of the Board maintains proper standards, as such, and shall have had at least two (2) years of practical experience in drug stores where physicians' prescriptions are usually compounded; provided however, that if the applicant shall have successfully completed a longer course than two (2) college years, of seven (7) months each, in such school or college of pharmacy, an additional year, or more, so successfully completed, shall be equivalent to one (1) year of such practical experience.

Provided that, any person, who is, at the time of the passage of this amendment, actually employed in a drug store, who shall on or before the first of October, 1917, file with the Board a sworn statement of proof of that fact, or who is registered by said Board as an assistant pharmacist shall be exempt from the requirement of attendance at a college or school of pharmacy, but shall be entitled, if of the required age, to examination upon the completion of four (4) years experience, as the same is herein defined, provided further; that, one (1) year of college work, as herein defined shall be equivalent to one (1) year of experience. If upon examination the Board finds him qualified, he shall be entitled to registration as such pharmacist.

Section 2. This Act shall take effect and be in force from and after its passage.

COMMERCIAL SECTION.

The commercial section was called to order by Chairman H. C. Kruckeberg after the meeting had been turned over by President Danek. After suitable introductory remarks, Chairman Kruckeberg presented his annual address in which he reviewed in an illuminating way some of the difficult commercial problems of the pharmacist. The address was discussed by Dean Wulling and others who were present.

"Questionable Methods of Advertising" was the title of an impromptu address by Mr. W. E. Arford. The speaker described in detail illegitimate methods being employed which have resulted in a number of pharmacists losing considerable sums of money.

At this time, President Binz, of the California Pharmaceutical Association, was introduced and extended the privileges of the floor. Mr. Binz spoke at length on the subject of pharmaceutical legislation. He stated that he had become convinced during the past year that prerequisite pharmaceutical legislation was most essential if pharmacists are to secure other measures which are urgently needed. Mr. Binz extended greetings from the California Association and expressed his appreciation for the cordial reception he had received in Minnesota.

NATIONAL LEGISLATION.

Mr. Charles H. Huhn presented the report of the committee on national legislation. The report included a consideration of the present status of price maintenance, narcotic legislation, anti-coupon legislation, and other measures of direct importance to pharmacists.

Mr. W. S. Parker, secretary of the North Dakota Board, was next introduced, and spoke upon prerequisite and patent medicine legislation. Sunday closing, Mr. Parker stated, was quite generally observed in North Dakota.

SCIENTIFIC SECTION.

Following the address by Attorney Brockmeyer, President Danek turned the meeting over to Dean F. J. Wulling as chairman of the scientific section. Dean Wulling introduced Professor Chas. H. Rogers, who has recently been appointed a member of the faculty of the College of Pharmacy of the University of Minnesota. Professor Rogers brought greetings from the West Virginia Pharmaceutical Association and stated that he hoped to do his share of the work of the University in turning out well-trained pharmacists.

The Northwestern Branch of the American Pharmaceutical Association met jointly with the scientific and practical section, and the following program was carried out:

1. A Symposium on the U. S. P.—IX. Opened and closed by Mr. C. H. Bollinger, and on the N. F.—IV, opened and closed by Mr. F. A. Upsher Smith.
2. Prescription Pricing, by Mr. Robert L. Morland.
3. Duty of the Public to the Pharmacist, by R. J. Messing.

4. Prescriptions and Prescription Compounding, by Mr. H. Martin Johnson.
5. Report of the Committee on Adulteration, by Professor Gustav Bachman.
6. Fractional Percolation, by Mr. O. J. Bloomo.
7. (a) The 1916 Results of Medicinal Plant Cultivation for Educational Purposes at the College of Pharmacy, University of Minnesota.
(b) A New Source of Supply for Ergot.
(c) Some Notes on Digitalis with Special Reference to *Digitalis lutea*.
(d) The *Journal* and the *Year Book* of the American Pharmaceutical Association, by E. L. Newcomb.
8. Report of Committee on College of Pharmacy, by Chairman A. J. Kline.

In addition to the above, a paper on "The Prescription Counter," by Mr. R. Bartelson, was read at the Thursday morning session, at which time the usual historical paper by Dean Wulling, of the College of Pharmacy, University of Minnesota, was also presented.

The report of the committee on adulteration by Professor Gustav Bachman elicited favorable comment. The report showed that the general quality of the drugs and medicines reported upon was somewhat higher than the reports heretofore indicated.

The paper on "A New Source of Supply for Ergot," by Secretary Newcomb, was accompanied by an exhibit consisting of different samples of waste cereals containing from seventeen to eighteen per cent. of select ergot. This ergot, the speaker stated, was the equal in pharmaceutical quality to that which is imported from Spain and Russia. It has not come into general use on account of the difficulty in mechanically separating it from the cereal. Mechanical processes have been used so as to concentrate the mixture to nearly fifty per cent. ergot strength.

NEW OFFICERS FOR 1917-18.

The following officers, having been duly nominated, were elected to serve the association for the coming year: Louis J. Aberwald, president; Charles MacGregor, Detroit, vice-president; Edward A. Grochau, Duluth, second vice-president; W. C. Haney, Marshall, third vice-president; E. L. Newcomb, secretary; R. J. Messing, treasurer; J. F. Danek, member of the executive committee.

The following were duly nominated as candidates for appointment to the Minnesota State Board of Pharmacy: Max Menzel, Pipestone; Arthur von Rohr, Winona; R. J. Messing, St. Paul; M. G. Johnson, Fulda; and R. E. Desmond, Minneapolis.

REPORT OF COMMITTEE ON RESOLUTIONS.

To the Officers and Members of the Minnesota State Pharmaceutical Association, your committee begs leave to report as follows:

The committee on resolutions has carefully gone over the President's address and approves the following resolutions:

1. That publicity work be continued for the ensuing year on the same plan as during the past year.
2. That the work of the Legislative Committee be commended and approved.
3. In view of the anti-drug-vending measure now being formulated by our Legislative Committee, your Resolutions Committee recommends that no action be taken at this time on recommendation No. 3 (of the President).
4. That we reaffirm a strong conviction in the justice of price maintenance and pledge ourselves to aid any effort of legislation in that direction.
5. That we urge closer coöperation between pharmacists and physicians.
6. That we continue our affiliation with the N. A. R. D.
7. We recommend that a scholarship be established to provide for the tuition for one year for one student at the College of Pharmacy of the University of Minnesota, same to be accredited to the student completing the second year with the highest rating, and being a citizen of the United States and a resident of the State at least five years.
8. That our association again voice its strong disapproval of the use of trading stamps and coupons, in merchandising.
9. We recommend that early closing be dealt with by individual communities.

Your committee recommends that publicity work be continued, as outlined in the report of the committee.

We recommend that the report of the Legislative Committee be adopted as presented and urge all members to coöperate in support of the bills now pending in the Legislature.

After careful consideration of the secretary's report, we recommend that same be adopted, and we further recommend that a hearty vote of thanks be extended to those who have contributed to the completion of the files of pharmaceutical proceedings in the various states. We also recommend that the association extend a rising vote of thanks to our secretary for his untiring efforts in establishing a complete set of proceedings and recommend the continuance of same.

We further recommend that the secretary prepare a yearly inventory of the visible assets of the association to be incorporated in his annual report.

We commend the efficient manner in which the financial and business affairs of the association have been conducted during the past year.

Considering the recommendation of scholarship, your committee feels that the matter is well covered for the present, by the recommendation as noted above.

We recommend that the purchase and selection of a permanent badge or button be left to the discretion of the executive committee.

Your committee commends the efficient and statistical report of the committee on dispensing by physicians.

It being clearly shown that the logical solution of the evil lies with the druggist in his respective locality, we recommend that the druggists be urged to supply physicians in their respective localities with the N. A. R. D. therapeutic topics.

Your committee on resolutions recommend that the work of the Publicity Committee be continued along the lines followed during the past year; that an appropriation of \$300 again be made for stenographic assistance; that the committee make an effort to issue one bulletin per month during the coming year; that the pharmaceutical journals be thanked for their coöperation.

We recommend that Professor Henry Kraemer, of Philadelphia, be elected an honorary member of this association.

We urge a rising vote of thanks to be extended to Mr. Eugene Brockmeyer, Professor Henry Kraemer and Thos. H. Potts for their presence, their interesting and valuable addresses and the commendable efforts which they have made for pharmacy.

Your committee further recommends a hearty vote of thanks to W. E. Burke for his untiring efforts in promoting the success of this meeting.

Your committee desires to express its appreciation of and thanks for the help in contributing toward the success of this meeting, by the Travelers' Auxiliary, the Northwestern Druggist, the faculty of the State University, the officers and members of the various committees and to Mr. Haueter for his splendid work in securing new members.

The committee also desires to express its appreciation to Dr. Newcomb for his services during the past year.

We wish to thank the press and the managers of the Saint Paul Hotel for the splendid accommodations and service rendered the association during the meeting.

Respectfully submitted,

Committee: J. P. JELINEK, R. J. MESSING, W. A. ABBETT, MAX MENZEL, HENRY RAUCH.

Owing to the short amount of time available to your committee, we recommend that the secretary prepare suitable memorials expressing the sympathy of the association on the demise of the following: A. D. THOMPSON, WM. MELENDY, H. H. MEYER, MARTIN I. WILBERT, DR. E. K. OGDEN, DR. W. G. BREDE and EDWIN F. WARREN.

The report of the Resolutions Committee was adopted in its entirety.

Chairman Jelinek of the Legislative Committee presented at this time the preliminary draft of the anti-drug-vending bill. The bill provides for the absolute prohibition of the sale of drugs and medicines by the itinerant vendor. After some discussion the measure was tentatively adopted and referred to the Legislative Committee for re-drafting and introduction.

SCIENTIFIC SECTION (*continued*).

President Danek requested Dean Wulling to preside during the completion of the scientific section program. Dean Wulling introduced Professor Henry Kraemer, of the Philadelphia College of Pharmacy, who delivered an illustrated lecture on "Pharmacognosy in its Relation to the Practice of Pharmacy." Professor Kraemer gave his personal views as to the subject matter of practical pharmacognosy in its relation to the retail druggist. He dwelt upon its relation to the study of the raw materials and products manufactured from them. He pointed out clearly the difference between pharmacognosy and materia medica, both in the subjective

treatment and the objects to be attained in the respective sciences. Emphasis was laid upon the fact that pharmacognosy is an active discipline and is concerned with the solution of every-day problems and the producing of tangible results. In the subsequent illustrated lecture many opportunities were indicated to show how the retail pharmacist could apply his professional knowledge and thereby make himself more valuable to the public and to himself. Professor Kraemer said: With Josh Billings we say, "It is better to know a few things right than many things that are not so." In the teaching of pharmacognosy he said: "I continually say to my classes that they only know what they can do. As a student, you may state a fact, but it is yours only when you can demonstrate it." The essential practicability of the science of pharmacognosy was emphasized, and in that connection it was pointed out how essential the science is to the pharmacist, because he deals with so many crude drugs and other raw materials, and hence is vitally concerned with their identity and quality. Professor Kraemer's wonderful collection of slides was divided into two classes: (1) Those dealing with the identification and determination of the quality of commercial drugs and allied products; (2) those dealing with the determination of the composition of complex commercial products. In connection with the latter, many valuable suggestions were given as to the opportunity of the pharmacist in the manufacturing line. The lecturer showed a series of about 150 magnificent lantern slides, many of them having been colored by Professor Kraemer himself.

OBITUARY.

William C. Alpers, dean and professor of pharmacy at the School of Pharmacy of Western Reserve University, Cleveland, Ohio, died on February 22, 1917. Professor Alpers was born at Hanover, Germany, July 7th, 1851. After the close of the Franco-German war, in which he took part, he came to America. Later he attended the New York College of Pharmacy and the University of New York, receiving the degree of doctor of science in chemistry from the latter institution. Dr. Alpers was always prominent in organized pharmacy, being at one time the president of both the New Jersey and the American Pharmaceutical Associations. Dr. Alpers's funeral took place in New York and was largely attended.

THE AMERICAN JOURNAL OF PHARMACY

APRIL, 1917

DIGITALIS THAPSI LIN.

BY O. A. FARWELL AND H. C. HAMILTON

Late in 1916, samples of a new drug were offered in America under the name of Spanish digitalis. It has no general resemblance to the official digitalis; indeed, at first glance, it looks more like mullein than anything else, being yellowish gray or yellowish green in color.

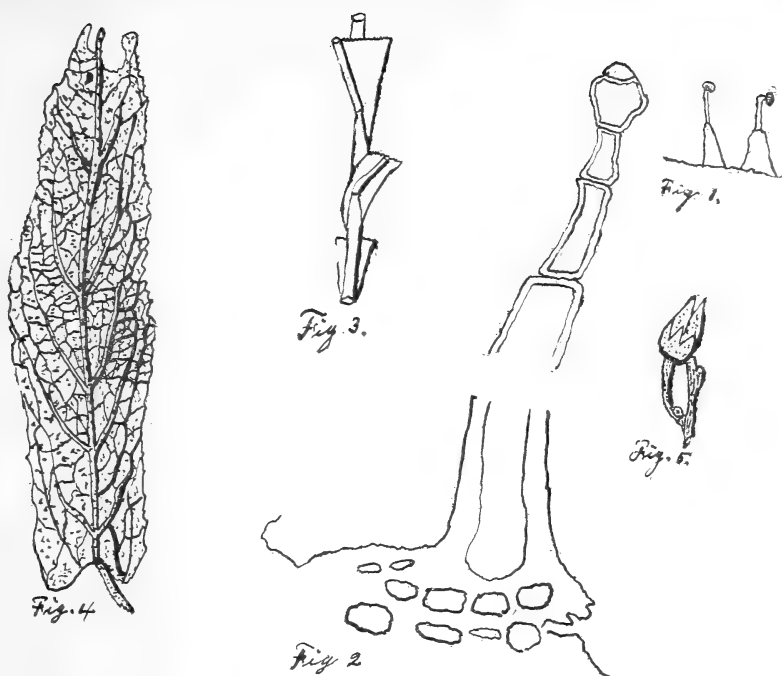
It has been thought advisable to investigate the histological and pharmacological aspects of the drug and the following papers are the result. Each author is responsible for his own section of the work.

HISTOLOGY.

BY OLIVER ATKINS FARWELL.

The drug consists of broken fragments of leaf (Fig. 4), stems (Fig. 3), and capsules (Fig. 5). Stems slender, terete or somewhat angular, green or purplish, densely covered with gland-tipped, 3-7 celled hairs (Figs. 1 and 2), $\frac{1}{2}$ a millimeter or less in length, velvety not rough. Bases of alternate leaves show a slight, decurrent line (Fig. 3) on the stem; leaves in fragments, rarely entire, 2-3 cm. wide by 3-15 in length narrowly oblong or oblong-lanceolate, gradually tapering to a broad sessile base, margin coarsely denticulate; on the lower surface the midvein is prominent with 4-6 inconspicuous pairs of veins, rugose; both upper and lower surfaces are covered with glandular hairs but they are not so long as those found upon the stem, soft velvety, not rough. Flowers occasional, cylindrical, upper parts purplish, slightly pubescent externally; when expanded, cylindrical below, contracted just above the ovary and then

abruptly expanded into a tube much longer than the usually 5-lobed, slightly 2-lipped limb; stamens 4, didynamous, attached low down on the tube, included; calyx present, glandular, 5-parted, about $\frac{1}{3}$ the length of the corolla, segments lanceolate. Capsules ovoid, about 15 Mm. in length, greenish and more or less glandular, to pale brownish or yellowish green, with only traces of the glandular indument, with fragments of the calyx at the base, on a slender pedicle, 3 Cm. or less in length, which is clavate under the capsule; fruit partially separating into two, one-celled, many-seeded sections, opening at the apex on the inner surface by a large pore. Odor, slight; taste, bitter and slightly acrid. This drug is not the official *Digitalis purpurea* Lin. as the leaves are sessile, somewhat decurrent, and of the same color on both sides. It may be the closely related *D. Thapsi* Lin. A cross-section of the upper portion of a stem, $2\frac{1}{2}$ Mm. thick, shows a pith 1 Mm. in diameter surrounded by a circle of wood (Fig. 6, *D*), 0.3 Mm. wide and a bark about .5 Mm. The outer bark shows epidermal cells that are small (12–20 microns) with rather thick outer walls covered with a strongly papillate cuticle (Fig. 7, *A*); immediately under the epidermis is a layer (130 microns) of unligified hypodermal cells 5–8 tiers in depth (Fig. 7, *B*); internally to this is a layer of parenchyma (Fig. 8), of equal depth but composed of fewer, 4–6 tiers of cells; the inner bark (Fig. 6) is made up of a continuous circle of bast (*A*) 130 microns deep and a narrower layer of sieve tissue (*B*). The cells of the pith (*E*) often reach a size of 70 microns in diameter, are slightly lignified or cutinized and non-porous. The stomata (Fig. 9) on the leaf occur in the ratio of about 8 to an area of 150 microns square. The epidermis is essentially the same as for the green bark of the stem. The palisade tissue is one cell in depth; the cells of the sponge tissue are well filled with oil. No crystals were detected. The midrib (Fig. 10) forms a very prominent keel on the dorsal (lower) surface of the leaf. The vascular strand is rather broadly ovate in outline, the phloem passing almost completely around the xylem. On the ventral side there are several layers of collenchyma and on the dorsal side the greater part of the tissue consists of the water-storage-cells with a layer or two of collenchyma between it and the epidermis.



FIGS. 1-5. *Digitalis Thapsi* Lin., showing leaf fragments, a capsule and gland-tipped hairs.

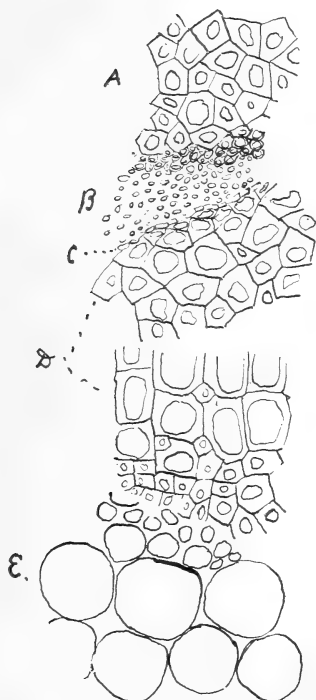
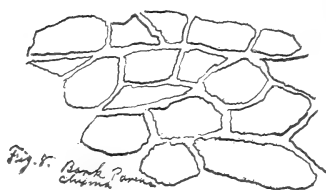
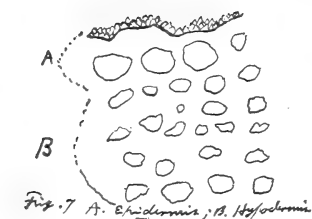


FIG. 6. Transverse section through portion of stem of *Digitalis Thapsi* Lin. A, bast fibers; B, sieve tissue; C, cambium; D, woody tissues; E, pith.



FIGS. 7-9. *Digitalis Thapsi* Lin., showing structure of stem and stomata on leaf.

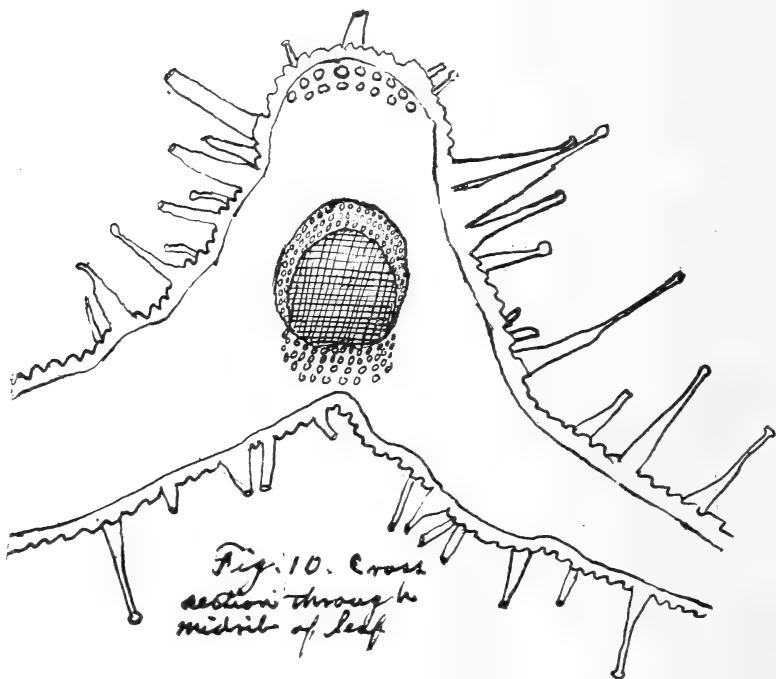


FIG. 10. Cross-section through midrib of leaf of *Digitalis Thapsi* Lin.

PHARMACOLOGIC ACTION.

BY HERBERT C. HAMILTON.

A preliminary investigation of *Digitalis Thapsi* to determine whether it possessed any of the therapeutic properties of the official drug was carried out on frogs by the M. L. D. method for standardization.¹ The drug in tincture form was properly diluted and injected into frogs in gradually decreasing doses until the minimum was found which was sufficiently toxic to kill.

This dose was just one third that of a similar tincture from an average sample of official drug as shown below. Data of final tests only are here recorded.

Standard Tr. Digitalis.

Wt. of frog.	Dose per gm.	Total dose.
20 .....	.009	18 alive
20 .....	.010	20 dead
19 .....	.010	19 dead
21 .....	.011	23 dead
22 .....	.011	23 dead

Tincture from Thapsi Drug.

18 .....	.0025	23 alive
20 .....	.0030	30 alive
20 .....	.0035	35 dead
21 .....	.0040	42 dead
22 .....	.0045	49 dead

Dilution 1 in 5.

The above are the final tests showing the comparative toxicities as determined by the minimum lethal doses of the two tinctures which are:

Standard Tinct. Digitalis	0.010
Tinct. Digitalis Thapsi	0.0035

That the drug belongs to the digitalis series of heart tonics is shown by the fact that in every case the heart was found to have stopped in systole, *i. e.*, with the apex of the heart strongly contracted.

A qualitative test further to confirm the action of the drug was made by dropping the diluted tinctures on the laid-bare frog's heart. The two tinctures were compared as before.

¹ Houghton and Hamilton, AMER. JOUR. OF PHARM., October, 1909.

First Experiment.

Frog pithed and stretched out on board.

Normal heart rate.

- 9:15.....20 beats in 20 seconds.
 9:16.....1 drop tinct. thapsi drug dropped on the laid-bare heart.
 9:20.....20 beats in 22 seconds.
 9:21.....20 beats in 23 seconds.
 9:24.....20 beats in 26 seconds.
 9:25.....2 drops, same solution.
 9:28.....20 beats in 30 seconds.
 9:30.....20 beats in 40 seconds.
 9:35.....Beats irregular and indistinct.
 9:40.....Stopped in systole.

Second Experiment.

Frog pithed and fastened to board.

Normal heart rate.

- 10:30.....20 beats in 24 seconds.
 10:35.....2 drops tr. digitalis U.S.P.
 10:37.....20 beats in 28 seconds.
 10:39.....20 beats in 30 seconds.
 10:45.....20 beats in 30 seconds.
 10:46.....2 drops, same solution.
 10:50.....20 beats in 35 seconds.
 10:55.....20 beats in 40 seconds.
 11:00.....2 drops, same solution.
 11:05.....20 beats in 50 seconds.
 11:10.....20 beats in 55 seconds.
 Irregular beats and final stoppage in systole.

Third Experiment.

Normal heart rate.

- 1:35.....20 beats in 20 seconds.
 1:40.....2 drops thapsi drug diluted, 1 in 3 from the tincture.
 1:45.....20 beats in 22 seconds.
 1:47.....20 beats in 23 seconds.
 2 drops, same solution.
 1:50.....20 beats in 28 seconds, very powerful.
 1:54.....20 beats in 30 seconds.
 1:55.....2 drops, same solution.
 1:57.....20 beats in 33 seconds.
 2:00.....20 beats in 50 seconds.
 Very irregular.
 2:15.....20 beats in 200 seconds, stopped in systole.

These experiments show the typical action of the drug in slowing and strengthening the heart beat to be identical with that of the U. S. P. digitalis. The powerful ventricular contractions were especially noticeable.

The other typical heart-tonic action of digitalis, namely, its pressor effect on the circulatory system, is observed best on an anesthetized dog. The dog is anesthetized with chloreton² which affects the system only slightly. These experiments failed to discover this typical effect when thapsi drug was administered while the tracings obtained after injection of the official drug almost invariably show a distinct rise in blood pressure followed, unless the dose be too large, by a return approximately to normal.

The two drugs were injected one following the other into two dogs. The first dog received first 0.2 Cc. of the tincture (freed from alcohol) of the thapsi drug. The rate was lowered, but no increase of blood pressure could be detected. After the action of the drug was apparently over, about one hour after first injection, 0.5 Cc. tr. digitalis, U.S.P. was administered followed shortly by the characteristic effects of the drug, including a distinct increase in blood pressure. The heart-beats soon became irregular and the dog died.

In another dog the order of dosing was reversed, the official tincture being administered first followed by an equivalent dose of the thapsi tincture. The effects observed from the first experiment were duplicated in the second, but reversed. The official tincture raised the blood pressure while the thapsi tincture had no effect on the blood pressure, but slowed the heart and the experiment ended by the irregular heart beats and final death of the animal.

While the experiments detailed above are more or less preliminary to a more exhaustive examination of the pharmacologic properties of this variety of digitalis, they are sufficient to show that it possesses at least two of the valuable properties of *Digitalis purpurea*, namely, the effects on the rate and amplitude of the heart beat. They show also that it more nearly resembles strophanthus in having no effect or at least very slight action on the blood pressure³—a property which in many cases is a distinct advantage.

The observed activity of the drug—a toxicity three times as great as that of the average official variety—is not to be taken as repre-

² Rowe, *Journal of Pharmacology and Experimental Therapeutics*, vol. 9, 1916.

³ Cushney, "Pharmacology and Therapeutics."

senting the activity of this variety. It represents that of only one sample and does not exceed that of occasional samples of American grown *Digitalis purpurea*. Further work and a number of samples would be required to determine its average activity.

That this drug may become a valuable adjunct to the repertoire of heart tonics is evident from its similarity in action both to the official variety of digitalis and to strophanthus, which latter is becoming more and more generally used in therapy.

A more extended pharmacologic research is planned for the near future.

DEPARTMENTS OF BOTANY AND
PHARMACOLOGY, PARKE, DAVIS & Co.,
DETROIT, MICH.

RAPID APPROXIMATE DETERMINATION OF MILK SUGAR IN HEADACHE POWDERS.

BY REGINALD MILLER.

This method depends upon the fact that milk sugar when heated with ammonium hydroxide gives a yellow to red color¹ the intensity of which is used as a measure of the amount present.

Take a weighed portion of the powder (about 1 g.), transfer to a small beaker and extract² repeatedly with a mixture³ of chloroform and absolute alcohol, by pouring about 12 mls of the mixture upon the powder, stirring with a glass rod, allowing to settle and then decanting the solution through a small filter paper, after the extraction

¹ The color produced is yellow when about .005 g. is present, and pinkish red in the presence of about .025 g. of milk sugar. On the addition of water (making volume up to 50 mls) the pinkish color fades to yellow after standing for five minutes.

A color similar to that obtained from .025 g. of milk sugar is produced by maltose, while dextrose and levulose produce a dark yellow, mannose a light yellow, and with cane sugar the solution remains colorless. Upon dilution to 50 mls with water, and after standing five minutes the depth of color corresponding to that obtained from .005 g. of milk sugar is produced by about .005 g. of maltose; .020 g. of dextrose or levulose or .050 g. of mannose.

² About six extractions are generally sufficient; in many cases the method may be applied directly by treating one gram of the powder with sufficient water to make 100 mls and then making the determination. Sodium bicarbonate does not interfere with the determination.

³ This mixture consists of two volumes of chloroform and one volume of absolute alcohol, and is used to remove acetanilid, phenacetin, salol, etc.

is complete, transfer the filter paper and residue to the beaker, add 25 mls of hot distilled water to dissolve the milk sugar; transfer this solution to a 100 ml volumetric flask, wash the filter paper and beaker with more water until the collected washings total 100 mls. Cool to room temperature and add water to the 100 ml mark.

Portions of this aqueous solution corresponding in volume to the amounts used in the standard tubes are measured into Nessler tubes and treated exactly like the standards.

Standards are prepared as follows:

Dissolve .500 g. of milk sugar in sufficient water to make 100 mls; one ml of this solution contains .005 g. of milk sugar.

Tube⁴ *A* — 1 ml of st. sol. = (.005 g. milk sugar) + 4 mls of water + 10 mls of conc. ammonium hydroxide.

Tube *B* + 2 mls of st. sol. = (.010 g. milk sugar) + 3 mls of water + 10 mls of conc. ammonium hydroxide.

Tube *C* + 3 mls of st. sol. = (.015 g. milk sugar) + 2 mls of water + 10 mls of conc. ammonium hydroxide.

Tube *D* + 4 mls of st. sol. = (.020 g. milk sugar) + 1 ml of water + 10 mls of conc. ammonium hydroxide.

Tube *E* + 5 mls of st. sol. = (.025 g. milk sugar) + 10 mls of conc. ammonium hydroxide.

These tubes as well as those containing the unknown are placed in a water bath and heated to about 95° C. for about half hour, the volume in each tube is then made to 50 mls and allowed to stand 5 minutes. The depth of color produced in the tubes containing the sample is compared with the standards until two are found (one standard and one unknown) that correspond. Computations are then made from the standard tube.

CHEMICAL LABORATORY,

DEPARTMENT OF HEALTH, CITY OF NEW YORK.

APPROXIMATE DETERMINATION OF NOVASPIRIN, ALONE OR WHEN MIXED WITH ASPIRIN.

BY REGINALD MILLER.

This method depends upon the fact that sodium hydrate produces a yellow color with novaspirin but remains colorless with aspirin.¹

⁴ Nessler tubes holding 100 mls are used.

¹ The aspirin must not be present in a greater proportion than two parts of aspirin to one part of novaspirin, if present in a larger amount, it interferes with the production of the yellow color.

The intensity of color produced is used as the measure of the quantity of novaspirin present.

Dissolve from .200 g. to .500 g. of powder (containing novaspirin or a mixture of novaspirin and aspirin) in 25 mls of 95 per cent. alcohol; add sufficient water to make 50 mls. Measure portions of this solution into Nessler tubes and treat as directed below in preparation of standards.

Standards are prepared in Nessler tubes as follows: A solution is made by dissolving .100 g. of novaspirin in 25 mls of alcohol and then adding sufficient water to make 50 mls.

One mil of this solution contains .002 g. of novaspirin.

Tube² *A*—1 mil of st. sol. + 25 mls of water + 2 mls of *N*/5 sodium hydroxide = .002 g. novaspirin.

Tube *B*—2 mls of st. sol. + 25 mls of water + 2 mls of *N*/5 sodium hydroxide = .004 g. novaspirin.

Tube *C*—3 mls of st. sol. + 25 mls of water + 2 mls of *N*/5 sodium hydroxide = .006 g. novaspirin.

Tube *D*—4 mls of st. sol. + 25 mls of water + 2 mls of *N*/5 sodium hydroxide = .008 g. novaspirin.

After the addition of the water and sodium hydroxide, more water is added to each tube, making a volume of 50 mls.

The tubes containing the standards are compared after an elapse of 5 minutes with those containing the samples until two are found which correspond in depth of color (one standard tube and one containing the sample). Computations are then made using the standard tube as a basis.³

CHEMICAL LABORATORY,

DEPARTMENT OF HEALTH, CITY OF NEW YORK.

RAPID APPROXIMATE DETERMINATION OF PHENACETIN WHEN MIXED WITH ACETANILID.

BY REGINALD MILLER.

This method is based upon the well-known nitric acid¹ test for phenacetin, which gives an intense yellow to orange-red color, and

² More satisfactory results are obtained by following the procedure outlined in this table. A more staple color is produced this way.

³ The readings should be made after an elapse of about five minutes but before an elapse of fifteen minutes when the color gradually fades and is untrustworthy.

¹ Autenreith-Hinsberg Test, *Archiv der Pharmacie*, Band 229, 456 (1891).

also upon the facts that phenacetin is soluble in methyl alcohol and the addition of nitric acid to such a solution properly diluted gives a yellow color, the intensity of which is used as a measure of the phenacetin present by comparison in Nessler tubes with standards.

Standards are prepared as follows: A standard solution is made by dissolving .500 g. of phenacetin in sufficient methyl alcohol² to make 100 mls; one mil of this solution then contains .005 g. of phenacetin.

Tube *A* — 1 mil of st. sol. + 4 mls methyl alcohol = .005 g. phenacetin

Tube *B* — 2 mls of st. sol. + 3 mls methyl alcohol = .010 g. phenacetin

Tube *C* — 3 mls of st. sol. + 2 mls methyl alcohol = .015 g. phenacetin

Tube *D* — 4 mls of st. sol. + 1 mil methyl alcohol = .020 g. phenacetin

Tube *E* — 5 mls of st. sol. + methyl alcohol = .025 g. phenacetin

To each tube except the last, methyl alcohol is added as indicated, in order to have an equal amount in each tube,³ then 5 mls of water and 3 mls of concentrated nitric acid is added to each tube.⁴

A qualitative test is made on the sample and this gives an idea as to the amount of phenacetin present. A definite amount of the sample is dissolved in methyl alcohol, so that one mil of the solution will contain between .005 g. and .025 g. of phenacetin. Portions of this solution are then measured into Nessler tubes and treated the same as the standards all of which must be made at the same time. After an elapse of 5 minutes make up the volume in each tube to 50 or 100 mls and compare the intensity of color in the tubes containing the sample, with the color produced in the tubes containing the standards until two are found (one standard and one unknown) that correspond. Computations are then made using the standard tube as a basis.

CHEMICAL LABORATORY,

DEPARTMENT OF HEALTH, CITY OF NEW YORK.

² Pure methyl alcohol is used (reagent).

³ This is necessary because the methyl alcohol decreases the intensity of color produced.

⁴ It is preferable to use a burette to measure the nitric acid.

SOME EXPERIMENTS ON THE CHEMICAL REACTIONS
OF DIPHTHERIA ANTITOXIN.BY ALBERT C. CRAWFORD AND CARLTON L. ANDRUS.¹

Many of us expect to find that future advances in rational therapeutics will be made along chemotherapeutic lines and by following the methods used by nature, *i. e.*, by the use of antitoxins, etc. Hence it is essential to know something as to the chemistry of the antitoxins. From this point of view, we recently reviewed the literature on the chemistry of diphtheria antitoxin.² As a result of this summary, it becomes evident that there are two views; one is, that the antitoxin is not necessarily a globulin, but is carried down with them on precipitation; the other view, held by most workers, is that diphtheria antitoxin is a globulin, and some uncorroborated work even suggests that ordinary egg globulin could be converted into diphtheria antitoxin.

We have been carrying on experiments to determine the reaction of diphtheria antitoxin to various reagents, and assuming it were not a globulin, to find whether it could be separated from the globulins. No doubt the response to reagents will vary, according to the solution in which the antitoxin occurs.

For part of this work we have used unconcentrated preparations obtained through the courtesy of the Cutter Laboratory at Berkeley. The first preparation contained over 500 antitoxic units to 1 Cc. It was prepared by heating a mixture of 70 parts of diluted antitoxic serum with 30 parts of saturated ammonium sulphate solution, *i. e.*, Banzhaf's method. The second preparation was simply a solution of the precipitate from antitoxic serum by from 30 to 50 per cent. saturation of ammonium sulphate. It contained 450 units to 1 Cc. The third preparation was a concentrated globulin solution (40,000 units in about 13.5 Cc.). This was prepared by a modified Banzhaf method and was given us by Parke Davis & Co. The fourth, was a globulin preparation from the Cutter Laboratory and contained 250 units per 1 Cc.

¹ The expense of this work was partly covered by a grant from the Committee on Therapeutic Research of the Council of Pharmacy and Chemistry of the American Medical Association.

² Crawford, A. C., and Foster, M. G., *Biochem. Bull.*, 1917, vol. 6, p. 1.

The determinations of the antitoxic values were made by the firms from which the preparations were obtained and controlled, when any variation was suspected. The toxin was made by the Cutter Laboratory and its L + dose determined there, but was checked with standard antitoxin obtained from Dr. G. McCoy of the Hygienic Laboratory.

In these experiments usually only three guinea pigs were used for each test. The injections were made subcutaneously in the mid-abdominal region and each injection had a volume of 4.5 Cc.³ All evaporations were done in vacuo between 50° and 55° C., and preparations which were not used immediately were usually kept in an ice box. Instead of filtering, solutions were obtained by centrifugalizing at 4,000 revolutions a minute.

The guinea pigs weighed about 250 Gm., although owing to difficulty in obtaining a proper supply, guinea pigs below 250 Gm. were often used. At the autopsy of those dying after the injections, enlargement and hemorrhages into the suprarenal glands, hemorrhages in the gastric mucosa and signs of local irritation were the only macroscopic changes looked for and found. No histological examinations were made.

Some of globulin preparation IV was evaporated to dryness in vacuo, and the flask jarred with a vibrator for varying intervals of time from July 20 to July 31, 1914, then put aside till February, 1917, but no signs of crystallization have appeared.

Fifteen Cc. of globulin II were shaken with 400 Mg. cholesterin and centrifugalized. The fluid retained its full antitoxic value.

After precipitation of antitoxin with aluminium hydroxide⁴ the filtrate of globulin preparation IV became inactive.

Five Cc. of globulin preparation I were evaporated to dryness and then twice extracted at room temperature with 20 Cc. acetic ether c.p. The undissolved portion possessed about the antitoxic value of the original, showing the antitoxin to be insoluble in acetic ether.

Five Cc. of globulin preparation I were evaporated to dryness then extracted with 20 Cc. *n*/10 NaOH and after a few minutes neutralized with 20 Cc. *n*/10 HCl. Even 3 times the theoretical amount which should neutralize one L + dose failed to protect. Evidently *n*/10 NaOH injures this antitoxin.

The same amount of this globulin was evaporated and treated

³ Rosenau, M. J., Hyg. Lab. Bull. 21, 1905.

⁴ *Journ. Amer. Chem. Soc.*, 1913, p. 820.

with 20 Cc. of $n/100$ NaOH, and after 10 minutes was neutralized with 20 Cc. of HCl $n/100$. This solution retained the full antitoxic value of the original, *i. e.*, short contact with $n/100$ NaOH does not injure antitoxin. No attempt was made to find if prolonged contact would injure it.

Five Cc. of globulin I were treated with 5 Cc. NaOH $n/10$, then neutralized with 5 Cc. HCl $n/10$. This was diluted to 150 Cc. 2 Cc. of this solution protected against one L + dose of the toxin. Apparently there was some slight loss in activity.

Five Cc. globulin II was diluted with 5 Cc. NaCl (0.85 per cent.), treated with 10 Cc. NaOH $n/10$ and neutralized with 10 Cc. HCl $n/10$. This had about the full antitoxic value, *i. e.*, $n/20$ NaOH does not injure the antitoxin, at least in this preparation.

Ten Cc. globulin preparation II were treated with 10 Cc. NaOH $n/10$ and shaken with benzol. The benzol residue was shaken with 25 Cc. NaCl (0.85 per cent.) Even 3 Cc. did not protect against one L + dose of the toxin. The mother fluid contained the full antitoxic value, showing that $n/20$ NaOH did not injure this antitoxin, and that it would not shake into alkaline benzol.

Ten Cc. of globulin II were treated with 5 Cc. NaOH $n/10$ and shaken with ether. The ether residue contained no antitoxin, while the mother fluid had its full value, *i. e.*, antitoxin is not soluble in alkaline ether.

Five Cc. of globulin preparation I were evaporated to dryness in vacuo and extracted twice with 20 Cc. of methyl alcohol (Merck). This alcohol was evaporated and the residue left by its evaporation was extracted with 10 Cc. normal NaCl. Even 3 Cc. of this did not protect from one L + dose of the toxin. Presumably no antitoxin was present.

The residue after methyl extraction was dissolved with 20 Cc. of NaCl (0.85 per cent.) and 10 Cc. $n/10$ NaOH. It did not dissolve in NaCl. It was then neutralized with 10 Cc. $n/10$ HCl. This solution had the full antitoxic value of the original solution. The diphtheria antitoxin as present in this preparation is insoluble in methyl alcohol.

The same amount of preparation II was evaporated to dryness and treated with methyl alcohol containing the same amount of NaOH as used in the above test, but as very small amounts seemed to be dissolved, no tests were made on animals.

Five Cc. of preparation II were treated with 5 Cc. of $n/10$ NaOH

and 40 Cc. methyl alcohol (Merck), and after standing about 20 to 30 minutes were centrifugalized. The precipitate was dissolved in 25 Cc. *n*/100 NaOH and then neutralized with the same amount of *n*/100 HCl. This gave a solution much the color of the original globulin preparation, although the precipitate was only slightly colored. This solution was slightly less active than the original preparation, perhaps due to standing, as several days elapsed before we were able to test this preparation.

10 Cc. of globulin preparation I were diluted with 10 Cc. of NaCl (0.85 per cent.) and precipitated with a solution of lead subacetate, drop by drop, from a burette. The preparation was then centrifugalized and the supernatant fluid precipitated with sodium hydrogen phosphate, centrifugalized and then diluted to 150 Cc. Even 3 Cc. did not protect against one L + dose of the toxin.

Several other attempts were made to free antitoxin from proteins by means of lead subacetate solution, but in most cases the filtrate when freed from lead was inactive. In one case it possessed slight antitoxic value, but in this case a possible excess of the alkaline lead solution may explain the result, *i. e.*, solubility of antitoxin or globulin in weak alkali. In this latter case the lead filtrate contained a few antitoxic units, yet produced no anaphylactic reaction in a guinea pig.

10 Cc. of globulin preparation I were diluted with 10 Cc. of sodium chloride (0.85 per cent.) and precipitated with a cold saturated aqueous solution of picrolonic acid by means of a burette, then centrifugalized. The centrifugalized fluid was shaken with acetic ether to remove picrolonic acid, at least partly, although acetic ether did not seem to us as suitable for this purpose as isobutyl alcohol. After separating the undissolved acetic ether, the solution was diluted to an arbitrary amount (250 Cc.) Even 3 Cc. of this solution failed to protect against one L + dose of the toxin. The precipitate was shaken with NaCl .85 per cent. and made into a colloidal suspension of 250 Cc. Only 1 to 3 Cc. were tested. 1 Cc. of this suspension protected against one L + dose of the toxin, showing that most and perhaps all of the antitoxin was in the picrolonic acid precipitate.

A similar preparation was also precipitated with picrolonic acid. The precipitate was shaken into a colloidal solution or suspension with distilled water. This was centrifugalized and the sediment shaken with NaCl (0.85 per cent.). The H₂O solution was diluted

to 250 Cc. One to three Cc. were tested. One Cc. protected against one L + dose. Presumably the neutralizing power was even greater than shown. The colloidal solution obtained with 0.85 per cent. NaCl was diluted to 350 Cc. Even one Cc. protected against one L + dose of the toxin. Some antitoxin went into both preparations.

Three Cc. of globulin preparation III were precipitated over night with a saturated aqueous solution of picrolonic acid. After centrifugalizing the clear solution was shaken several times with iso-butyl alcohol. The alcohol gave no precipitate. The colorless solution was made up to 250 Cc. Even 3 Cc. of this did not protect against one L + dose of the toxin. Evidently the filtrate, *i. e.*, the centrifugalized solution after picrolonic acid contained no antitoxic units. This highly concentrated globulin corresponded in its reaction to picrolonic acid to preparation I which was of a lesser concentration.

The precipitate from picrolonic acid was shaken with NaCl (0.85 per cent.) and made into a suspension. This was shaken several times with iso-butyl alcohol to remove picrolonic acid. The isobutyl alcohol precipitated a gelatinous mass, which after centrifugalizing became colorless on further shaking with iso-butyl alcohol. This white gelatinous material was dissolved in NaCl (0.85 per cent.) by the addition of NaOH $n/10$ and the corresponding amount of $n/10$ HCl was then added. This colloidal solution was made up to 500 Cc. with NaCl (0.85 per cent.). This solution had antitoxic value, but did not correspond to the full number of units used. This may perhaps have been due to the long contact with iso-butyl alcohol.

The centrifugalized solution after iso-butyl alcohol precipitation was made up to 100 Cc. but even 3 Cc. did not protect against one L + dose, so that it contained few if any antitoxic units. Evidently iso-butyl alcohol precipitates antitoxin at least from this preparation.

Two Cc. of preparation III (8,000 antitoxic units) were precipitated with a saturated aqueous solution of picrolonic acid and the precipitate was shaken several times with NaCl (0.85 per cent.) centrifugalized, then the precipitate shaken again, then filtered through filter paper. The filtrate was then made up to 750 Cc. Even 3 Cc. did not protect from one L + dose of the toxin. The loss of activity may have been due to the filtering through filter paper, or to the preparation having stood several days, but it was thought, as there was picrolonic acid present, that this should preserve it.

10 Cc. globulin preparation I, diluted with an equal volume of

NaCl (0.85 per cent.), was precipitated with a saturated aqueous solution of uranium acetate c.p., then centrifugalized. The precipitate was dissolved in normal salt solution by the addition of a few drops of $n/10$ NaOH. The uranium was precipitated by Na_2HPO_4 and centrifugalized. This solution was diluted to 250 Cc., an arbitrary amount. It was found that one Cc. protected from one L + dose. Less was not tried. This solution gave a precipitate with picrolonic acid, gold chloride, platinum chloride, copper acetate and alcohol. The filtrate after precipitation with Na_2HPO_4 and centrifugalizing was diluted to 250 Cc. Even 3 Cc. of this solution did not protect from one L + dose. Uranium acetate precipitates antitoxin.

Globulin preparation I, diluted with an equal volume of normal NaCl, was cautiously precipitated with uranium acetate solution, then centrifugalized. The precipitate was treated with 15 Cc. NaCl (0.85 per cent.) and 15.6 Cc. $n/10$ NaOH. This formed an emulsion. The emulsion was precipitated with Na_2HPO_4 , then precipitated with picrolonic acid. The precipitate was suspended in NaCl (0.85 per cent.) and shaken with isobutyl alcohol (Merck) to remove the picrolonic acid. The solution was diluted to 250 Cc. Even 3 Cc. did not protect from one L + dose.

The iso-butyl alcohol gave a white precipitate which was made into a colloidal solution with 250 Cc. NaCl (0.85 per cent.). 2 Cc. of this solution protected against one L + dose of the toxin.

Five Cc. of preparation II (2,250 units) were precipitated with platinum chloride (10 per cent.) aqueous solution. The precipitate was shaken with $n/100$ NaOH as well as with NaCl (0.85 per cent.) centrifugalized, neutralized and diluted to 350 Cc. Even 3 Cc. of this solution did not protect against one L + dose of the toxin. A second sample was likewise precipitated with the same platinum chloride solution and the precipitate stirred with distilled water, then with NaCl (0.85 per cent.) and then centrifugalized. The washings from the precipitate and the centrifugalized solution from the platinum were added together and warmed on a bath to 65°C. ; then, while warm, were saturated with H_2S and the gas boiled off in vacuo. In this case the platinum sulphide separated nicely giving practically a colorless solution. There is some difficulty in obtaining a colorless solution in every test. The solution was filtered through filter paper and diluted to 100 Cc. One Cc. protected against one L + dose. After standing two days, one Cc. of

this solution was diluted to 22 Cc. Three Cc. of this dilution did not protect against one L + dose of the toxin.

The 100 Cc. solution gave no precipitate with uranium acetate c.p., gold chloride, mercuric chloride, or one half saturation with ammonium sulphate, but gave a slight precipitate with picrolonic acid. Picric acid gave no precipitate. This concentration gave no biuret reaction and no test for tryptophane with magnesium glyoxalate and sulphuric acid.

To see if the last dilution was inactive owing to deterioration, no extra-preservative having been added, the original 100 Cc. was tested 4 days after its preparation and 1 Cc. still protected against one L + dose of the toxin.

A similar precipitation was made with a freshly prepared solution of platinum chloride (10 per cent.) and the precipitate was washed with NaCl solution instead of with distilled water as in the preceding case. The washings and centrifugalized solution could not be freed from platinum by H_2S alone, even on adding an excess of platinum, but cleared with H_2S when 1 Cc. of HCl $n/10$ was added to the solution (111 Cc.). After dilution to 150 Cc. it was found that even 2 Cc. did not protect against one L + dose of the toxin.

Five Cc. of the same antitoxin was precipitated with a solution of platinum chloride made 2 days previously. The precipitate settling on centrifugalizing was washed with distilled water as in the first experiment and after passing H_2S became colorless save for a minute trace of golden color. This was diluted to 150 Cc. Even 1 Cc. protected against one L + dose of the toxin.

From these experiments it is evident that NaCl interferes with the precipitation of platinum unless acid is added.

There are several ways of interpreting the activity of the platinum filtrate; first, that it contained the antitoxin free from globulin or that the acidity, which resulted from passing H_2S , weakened the toxin, or that a trace of colloidal platinum sulphide remained in solution and weakened the toxin.

The acidity of the first platinum preparation corresponded to 0.3 Cc. $n/10$ HCl to each Cc. The second, in which much NaCl had been used and which was inactive, reacted for 0.55 Cc. $n/10$ HCl for each Cc. The third preparation which contained about as many antitoxic units as the first platinum preparation, reacted for 0.2 Cc. $n/10$ HCl to each Cc.

The L + dose of the toxin (0.42 Cc.) was treated with 0.42 *n*/10 HCl and let stand in the thermostat for ½ hour, then neutralized with 0.42 *n*/10 NaOH. This preparation killed a guinea pig in 24 hours, the same time as the untreated toxin. Evidently weakening of the toxin by acid was not the cause of the survival of the guinea pigs after injection of the toxin mixed with platinum filtrate from the globulin preparation.

To see if an excess of acidity was the cause of the inactivity of the second test, 1 Cc. of preparation II was mixed with 1 Cc. HCl *n*/10 placed in an incubator for ½ hour, then neutralized with NaOH. This was then diluted to 20 Cc., *i. e.*, to theoretically correspond to the dilution in the second platinum experiment. One Cc. of this solution protected against one L + dose of the toxin, thus showing that this amount of acid did not destroy the antitoxin.

As a control test, 7.5 Cc. of platinum chloride (10 per cent.) were diluted to 100 Cc. with distilled water and while warm were saturated with H₂S. On filtering this gave a solution perhaps darker in color than the preceding active platinum filtrate. This color was due to the presence of a trace of platinum sulphide. Injections were made of 1 Cc., 2 Cc., and 3 Cc. but these did not kill, or even sicken, the guinea pigs. Of this solution, 1 Cc. and 2 Cc. were each mixed with one L + dose of the toxin diluted as usual, and placed in the incubator for one half hour. Even 1 Cc. protected against one L + dose of the toxin, showing that the protection was due to the small amount of platinum present and that the antitoxin had not been freed. This action must presumably have been due to some catalytic action of the platinum as the concentration was presumably too weak to precipitate any of the toxin. These results may suggest a therapeutic use for platinum compounds.

From our review of the literature and from our own work at present we find no chemical proof that a separation of antitoxin and globulin can be made, although Banzhaf's work and that of Hurwitz and Meyer might suggest it.

Note.—Several of the guinea pigs on which the platinum experiments were made developed abscesses.

ASSAY PROCESSES OF THE U. S. P. IX.

BY PHILIP ASHER, PH.G., M.D.

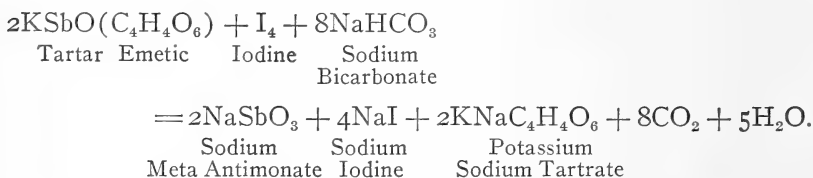
(Concluded from page 121.)

IODOMETRY.

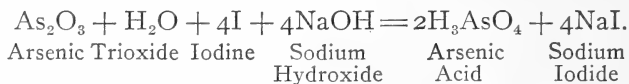
Iodometric methods are followed in quite a number of U. S. P. assays. These may be divided into two classes. First, those in which direct addition of $n/10$ iodine forms with the substance under examination a definite compound, and the completion of the reaction is shown by the production of a blue color with starch. Secondly, those in which either an excess of iodine is added, or iodine is liberated by the addition of potassium iodide, and the liberated iodine titrated with sodium thiosulphate.

To class one belong the assays of tartar emetic, arsenic trioxide and sodium thiosulphate.

Antimony and potassium tartrate. .5 Gm. of the salt is dissolved in 30 mls of water, to which are added 25 mls cold saturated sodium bicarbonate solution, and starch as an indicator. This is immediately titrated with $n/10$ iodine.



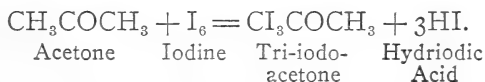
Arsenic trioxide. .2 Gm. arsenic oxide accurately weighed is dissolved in 20 mls of hot water by the gradual addition of NaOH T. S. This is neutralized with dilute sulphuric acid. To the cooled solution, sodium bicarbonate is added and titrated with iodine.



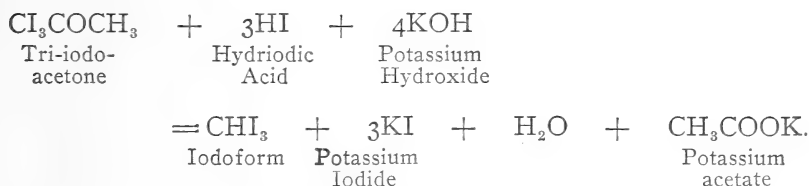
In the second class are the assays of the ferric salts, crude calcium sulphide, chromium trioxide, iodine, acetone, sodium bisulphite and arsenate, phenols, thymol iodide, mercury salicylate, and mercurous iodide and chloride.

The assay of crude calcium sulphide introduces a new method. To the salt, water is added and ammonium chloride solution, and allowed to stand for a short time. Then cadmium chloride is added, and after agitating, some acetic acid is added and the whole heated for 15 minutes. The supernatant liquid is decanted through a filter, and the precipitated cadmium sulphide agitated with acetic acid, and the precipitate is washed with acetic acid. The precipitate is returned to the flask, iodine solution added, and HCl. The flask is stoppered, and the excess titrated with sodium thiosulphate.

Acetone. In this assay the acetone is treated with KOH and iodine solution, and HCl, and titrated with sodium thiosulphate. The iodine converts the acetone into tri-iodoacetone and hydriodic acid:

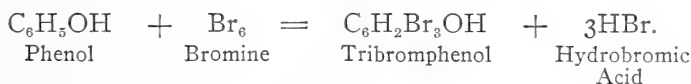


The tri-iodoacetone is then acted upon by the KOH, being converted into iodoform and potassium acetate, and the hydriodic acid neutralized by the KOH:

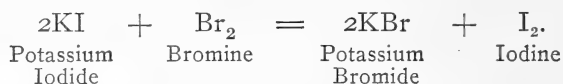


The excess of iodine forms with the alkali potassium iodide and iodate, and these are decomposed by the HCl into iodine. The excess of iodine used is determined by sodium thiosulphate.

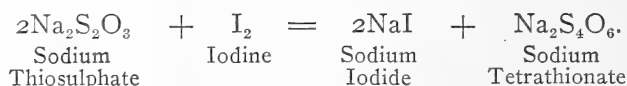
Phenols are assayed by adding to them $n/10$ to bromine solution and HCl, allowing to stand 15 minutes, and quickly adding potassium iodide, care being taken to avoid loss of bromine or iodine by keeping the flask tightly stoppered. After standing for some time, 1 mil chloroform is added, shaken, and excess of iodine titrated. This assay takes place in three stages. In the first, the bromine combines with the phenol, forming tribromophenol:



The next step is the liberation of iodine by the free bromine:

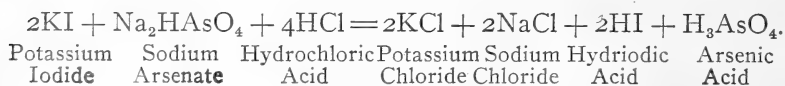


In the last stage, the decolorization of the iodine by the sodium thio-sulphate:

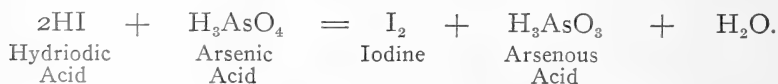


Thymol iodide, $\text{C}_{20}\text{H}_{24}\text{O}_2\text{I}_2$. The assay of this compound differs from general methods. The thymol iodide is mixed with sodium carbonate and heated in a crucible until carbonized. The residue is extracted with water and washed on a filter until an opalescence is no longer formed with silver nitrate. The solution is heated and treated with potassium permanganate until a faint pink color remains. Sufficient alcohol is added to remove the pink tint, and the solution cooled. Water is added to make 200 mls. It is mixed and filtered. To 100 mls of the filtrate, potassium iodide is added, and an excess of sulphuric acid, and the liberated iodine is titrated. The principles underlying the above are the following: The iodine of the thymol is converted into sodium iodide when heated with the sodium carbonate. The mixture is converted into sodium iodate by the potassium permanganate. The action of the sulphuric upon the sodium iodate and potassium iodide results in the formation of hydriodic acid and iodic acid, and these reacting upon each other liberate iodine.

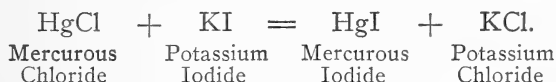
Sodium arsenate. A weighed amount of the salt is dissolved in water, and heated to 80°C . HCl is added and potassium iodide. After standing for some time, the liberated iodine is titrated. In this assay the following reactions take place: The HCl decomposes the salts, forming their respective acids:



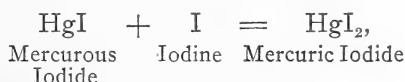
The acids then react upon each other:



In the assays of mercurous chloride and iodide, an interesting phase is introduced. The salt is mixed in a flask with water, iodine solution is added, and potassium iodide, and the mixture allowed to stand, with occasional agitation, until complete solution has taken place, and the excess of iodine is titrated. With mercurous chloride the potassium iodide converts it into mercurous iodide, and it is subsequently changed into mercuric iodide by the oxidation of the iodine:



Then



which is soluble in potassium iodide.

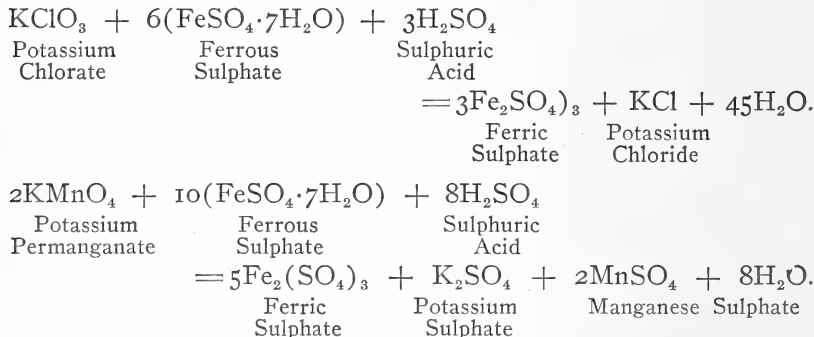
In the assay of mercury salicylate, the above method is also followed, but a preliminary reduction to mercurous chloride is made. The salt is first treated with sulphuric and nitric acids and digested on a water bath until dissolved. This produces mercuric sulphate and nitration products of salicylic acid. The solution is diluted with water and hydrogen peroxide added to oxidize anything that may have a tendency to reduce the mercury to a metallic condition. The solution is then treated with hypophosphorous acid, followed by sodium chloride. The hypophosphorous acid reduces the salt to the mercurous state, and the sodium chloride then converts it into mercurous chloride. The precipitate is thoroughly washed, and the precipitate and filter are returned to the flask, and the method is then followed as under mercuric chloride.

POTASSIUM PERMANGANATE METHOD.

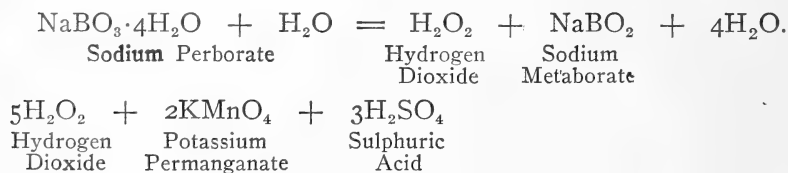
There are quite a number of the official compounds, the strengths of which are ascertained by titration with $n/10$ potassium permanganate. Some of these are by direct titration or by an excess of the permanganate, and titrating such excess with oxalic acid. Others are first converted into oxalate by the addition of an excess of oxalic acid, and this excess is subsequently titrated with permanganate, or by conversion of soluble salts into oxalates by means of ammonium oxalate. To the first class belong the ferric salts, hydrogen peroxide, sodium nitrite and perborate. In the latter class

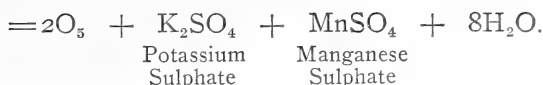
are calcium carbonate and oxide, solution lead subacetate, lead acetate and oxide and manganese dioxide. For example, calcium carbonate is first converted into the chloride by HCl. To this, oxalic acid is added, and sufficient ammonia water to make alkaline. After standing over night, the solution is filtered, washed, acidified with sulphuric acid, and the excess of oxalic acid titrated with permanganate.

In the assay of potassium chlorate several new features are introduced. .1 Gm. of potassium chlorate is dissolved in 10 mls of water, to which is added 25 mls acidulated ferrous sulphate T.S. The solution is placed in a flask with a valve stopper, made by cutting a longitudinal strip 15 Mm. long in a rubber tube and closing the end with a glass rod. This allows for the escape of gases without permitting the air to return to the flask. The solution is boiled 10 minutes, cooled, and 10 mls manganese sulphate solution added, and the excess of ferrous sulphate titrated with potassium permanganate. A parallel is run without potassium chlorate. The result of the former is subtracted from that of the latter. The reactions involved are as follows:

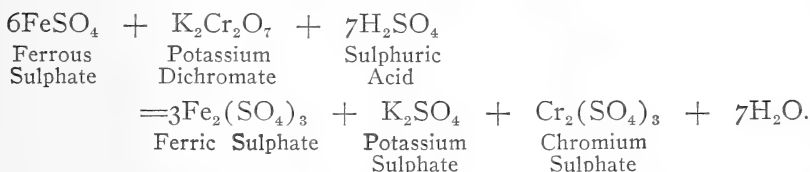


The assay of sodium peroxide presents nothing of special moment, except the fact that when it is dissolved in water, it decomposes into H_2O_2 and sodium metaborate. The assay is conducted by adding to the weighed salt dissolved in water, sulphuric acid, and titrating with potassium permanganate.





There is only one assay in which potassium dichromate is used, saccharated ferrous carbonate. The salt is dissolved in diluted sulphuric acid, and immediately titrated with potassium dichromate, potassium ferricyanide being used as an indicator:



There are but few of the compounds and preparations of the U. S. P. in which potassium sulphocyanide is used: silver nitrate, solution arsenic and mercury iodide, mass of mercury, mercury and chalk and mercuric oxide.

In the assay of mercuric oxide the mercuric compound is treated with nitric acid, whereby it is converted into mercuric nitrate. This is diluted with water, ferric alum added as an indicator, and titrated with sulphocyanide of potassium. In this process, the mercury is precipitated by the sulphocyanide as the insoluble mercuric sulphocyanide, the completion of the reaction is shown by the formation of a yellowish-red color.

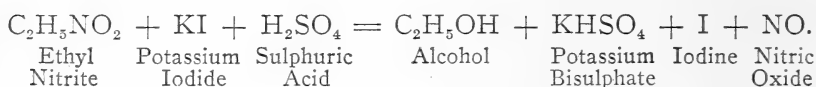
The mercury of solution of arsenic and mercury iodide, is determined by adding to the solution KOH and then formaldehyde, by which the mercury is reduced to the metallic condition. The mercury is washed by decantation, and dissolved by nitric acid. The same process is followed as under the oxide.

In determining mass of mercury, the substance is treated with sulphuric and nitric acids whereby mercuric nitrate is formed, and the organic matter is destroyed. Potassium permanganate is also added until a pink tint is produced, making certain that no organic matter remains, and the color discharged by oxalic acid T.S. The sulphocyanide method is then followed.

GASOMETRIC METHODS.

But three substances of the Pharmacopœia are assayed gasometrically: oxygen, amyl nitrite, and spirits ethyl nitrite. The determination of the two latter is carried out in a nitrometer, supplied

with control tubes. The nitrometer is completely filled with saturated salt solution, care being taken that no air is present. When ready the control tube is placed at a low level. The substance to be assayed is first prepared by adding to it potassium bicarbonate, to remove any acid that may be present. The quantity of material to be assayed is added to the nitrometer, followed by potassium iodide and sulphuric acid. The whole is shaken, and after the reaction has ceased, the equilibrium tube is raised to the level of the liquid in the nitrometer and the reading taken. Temperature and barometric pressure should also be considered.



The purity of oxygen is determined by placing fifty mils of it into an accurately calibrated tube, with 10 mils of alkaline pyrogallol solution; not less than 95 per cent. by volume should be absorbed.

MISCELLANEOUS ASSAYS.

The refractometer is directed to be used in determining the purity of several of the volatile oils.

The polariscope is used principally in the testing of volatile oils. Its use is also directed in the assay of spirits and liniment of camphor.

The assay is conducted by taking the mean of 4 polariscopic readings of the spirit in a 200 Mm. tube. Correction to be made for temperature. 60 mils of the spirits is also evaporated on a water bath, and when the camphor begins to solidify, it is stirred until dry. The camphor is then placed on a watch crystal, covered with an inverted funnel, and heated by a Bunsen burner to sublime the camphor. 2.5 Gm. of the sublimate are dissolved in sufficient 95 per cent. alcohol to make exactly 25 mils, and the mean of four polariscopic readings are taken. The minutes of rotation of the spirits divided by the minutes of rotation of control, multiplied by 10 gives the grams of camphor in a hundred mils of the spirit.

SAPONIFICATION.

Saponification methods are used in the U. S. P. in assaying fats, resins, wax, and volatile oils. The saponification value indicates the number of Mgs. of KOH required to saponify one gram of

the oil. The acid number for resins implies the number of Mgs. KOH required to neutralize one gram of the resin.

One compound of the U. S. P., liquid petrolatum, contains a viscosity test. It is conducted by placing a mark at 2 Cm. below the bulb of a 50 mil pipette, filling with distilled water to the upper level, and noting the time in seconds required for the level of the water to reach the lower mark. The liquid to be tested, is then drawn to the upper mark of the pipette, and the time in seconds it requires to reach the lower level, divided by the number of seconds taken by the water, indicates its viscosity.

Under each drug is given the percentage of the limit of ash it should contain.

Some of the zinc and mercury compounds are tested electrolytically.

Amylolytic and proteolytic methods are also included among the U. S. P. assay methods; the former for pancreatin, diastase and malt; the latter for pepsin.

In addition to the chemical methods of assay, several of the drugs are directed to be assayed biologically: aconite, digitalis, strophanthus and squills. The biological method is also used in connection with biological substances now included in the Pharmacopœia: suprarenal gland, dried hypophysis, serums, etc.

ALKALOIDAL ASSAYS.

The active constituents of a large number of the vegetable drugs reside in alkaloids. Time will not permit of detailing these methods. With but one or two exceptions the alkaloids are determined volumetrically. The drug is macerated with a mixture of one volume of chloroform and two of ether. After standing a short time ammonia water is added, and shaken vigorously every ten minutes for two hours. Some water is added, and the whole allowed to settle. The liquid is decanted, and an aliquot part filtered through cotton into a separator. The alkaloids are extracted by shaking out with weak sulphuric acid. The acid washings are made alkaline with ammonia water and are extracted by repeated shakings with chloroform. The chloroform solution is evaporated and dissolved in an excess of $n/10$ sulphuric acid, and the excess of acid used is titrated with $n/50$ alkali, cochineal being used as an indicator. From the number of mils of acid consumed, the per cent. of alkali is determined by multiplying by its coefficient, and dividing by the

amount of drug used. Preparations containing alkaloids are similarly treated. They are first evaporated to a small bulk and then the extraction is carried out as above outlined.

CANTHARIDES.

Cantharides is assayed by macerating 15 Gm. of the drug with 150 mls of a mixture of 2 volumes of benzene and 1 volume of benzine to which has been added 2 mls of HCl. It is allowed to stand 10 hours then warmed to 40° C. and maintained at this temperature and frequently agitated for three hours and cooled. 100 mls are decanted and evaporated to about 5 mls. To the evaporated solution are added 5 mls of chloroform and set aside. After the solvent has evaporated an equal volume of 10 mls of dehydrated alcohol and benzine saturated with cantharidin, are added to the crystals and allowed to stand 15 minutes. The liquid is decanted through a pellet of cotton and the crystals washed with successive portions of the saturated cantharidin solution to remove fat and coloring matter and the washings passed through the cotton. The cotton is then washed with warm chloroform and the washings added to the beaker containing the crystals and the solvent evaporated by a blast of air and the crystals are dried at 60° C. and weighed. The official requirement is that cantharides should contain not less than .6 per cent. of cantharidin.

ASSAYS NEEDED.

The revisers of the U. S. P. have performed an excellent piece of work, but the assays for a large number of preparations are just as essential as the assays of the substances from which they are made, and these should have been included. While it is true that the articles entering into the composition of these preparations may be up to the official requirements, what assurance is there that the preparations made therefrom are of standard strength? While these standards will hold in check the manufacturers of chemicals and the jobbers selling the official drugs, etc., there is nothing in the official requirements to hold a pharmacist who may attempt to make his preparations deficient in strength.

The following preparations should have included an assay method: Emulsions of asafœtida and cod liver oil; especially a test for the former to show that it had not been prepared from the tincture. The glycerites, boroglycerite and tannin; the spirits should

have an assay method, particularly to show the amount of the volatile oils present. Also the following: Solution cresol compound, liniments of Belladonna and chloroform; ointments of belladonna, tannic acid, boracic acid, mercury, ammoniated mercury, mercury nitrate, iodine, iodoform, stramonium, sulphur and zinc oxide; mercury oleate; pulv. ipecac and opium and cerate cantharides.

TECHNICAL EDUCATION AND METRICS.

BY H. V. ARNY, PH.D.

It is a great privilege to bring to the National Association of Manufacturers of Medicinal Products the greetings of the American Conference of Pharmaceutical Faculties.

This organization, over which I had the honor of presiding last year, consisting of 42 of the best schools of pharmacy in this country, was organized in 1900 for the purpose of promoting the cause of pharmaceutical education. It has performed its work well in the past. It has a greater mission for the future, and this mission is of personal interest to every member of the Association of Manufacturers.

In the past much of our work has been the very important task of fitting young men for retail pharmacy in a course of instruction covering two years. This always has been and always will be a vital function of the College of Pharmacy. Of scarcely less importance, however, is the training of young men for technical positions in your manufacturing plants in a course covering four years. Are we, the colleges of the conferences, doing our duty to you in this direction? If we are not, you practical and energetic business men should coöperate with us in making courses in technical pharmacy what they should be.

There are three ways in which the pharmaceutical industries should coöperate with the colleges in making these four year technical courses a success.

Two of the three ways are already in vogue to a certain extent. These are: (a) Permitting experts from your plants to give one or more special lectures in the courses on chemical technology given in our colleges; (b) permitting our technical students to visit your plants.

The third and most important type of coöperation is one, which, as explained at some length by the writer in a special article on the subject, is based on the establishment of industrial fellowships in pharmacy along the lines instituted by the late Robert Kennedy Duncan and now seen in its fulness at the Mellon Institute at Pittsburgh.

Reduced to its simplest terms, the idea is this: You manufacturers turn to the colleges for young men to *break in* for service your plants; you manufacturers have problems requiring research that some of us teachers might aid you solve. Why would it not be feasible to turn such problems over to those of our colleges of pharmacy providing suitable technical courses? Let the proposition take the shape of an industrial fellowship; that is, let the teacher select some likely graduate to carry out the laboratory work under his supervision. The expense of the research to be borne by the interested manufacturer. Such an Industrial Fellowship would perform the triple service of (*a*) encouraging research, (*b*) trying out for you a likely employee without wasting the time of your own force in the experiment, (*c*) training the aforesaid likely employee in the very lines in that he would be of most service to you. If Duncan's industrial fellowship idea has proven of distinct value in the chemical industry, there is no reason why the same idea could not be applied with great success in a true coöperation between the Association of Manufacturers and the Colleges.

I am present with you this morning not merely to convey the greetings of the Conferences of Faculties, but also as a representative of the newly organized AMERICAN METRIC ASSOCIATION. This Association was formed on December 27, last, and the best proof of your interest was shown in the appointment by your executive board of Mr. George Simon to represent the Association of Manufacturers on that occasion. Nor do I need to take much of your time in telling you the advantages of the metric system. From the days when Dr. Squibb marketed his pharmaceutical products in metric packages, to the present time, when many of you prepare metric price lists for export business, manufacturing pharmacy has been far-sighted enough to see that the sooner we become a metric country the better.

At this time I wish to thank the representatives of the Association of Manufacturers in the Drug Trade Conference for their coöperation in securing the endorsement of the new A. M. A. by that body.

I wish also to mention how splendidly pharmacy was represented at the organization meeting of our metric association: a representation so appreciated by the others that two druggists—Dr. Wm. J. Schieffelin and the speaker—were placed on the list of those selected to conduct the affairs of the Association. The list of officers should be mentioned to show the type of business men now interested in metrics. They are: *President, George F. Kunz* of New York, gem expert and chairman of the metric committee of the American Institute of Mining Engineers. *First Vice-President, Wm. Jay Schieffelin*, of New York, wholesale druggist and member of the metric committee of the N. W. D. A. *Second Vice-President, Emil P. Albrecht*, secretary of the Philadelphia Bourse. *Third Vice-President, Orrin E. Stanley*, of Portland, Oregon, civil engineer and secretary of the Society for the Promotion of the Metric System. *Secretary, Howard Richards, Jr.*, of New York, electrical engineer and founder of the Metric Association of China. *Treasurer, Arthur P. Williams*, of New York, wholesale grocer and chairman of the trade committee of the National Wholesale Grocers Association. *Executive Committee, H. V. Arny*, New York, chemist; *F. R. Drake*, Easton, Pa., wholesale grocer; *S. L. Stratton*, Bureau of Standards, Washington, D. C.; *W. P. Wilson*, director Phil. Commercial Museum; *A. E. Kennelly*, Cambridge, Mass., electrical engineer. At present, the only paid official is the assistant secretary, a young man, doing our stenographic work. But we hope to soon be in a position to employ an executive secretary for field work.

Noteworthy is the interest of the Wholesale Grocers and the Canners in the Metric Association. Their interest is not purely academic as their use of metric quantities on the "net weight" statements on their labels clearly show.

As to membership the Association provides three classes:

1. *Individual members*, with dues of not less than \$2 a year.
2. *Firms*, with dues of not less than \$5 a year.
3. *Associations*, with dues of not less than \$10 a year.

Each member of the Association is permitted five (5) delegates at our annual convention.

I dare to express the hope that each person in this room will become an *individual member*, and that many of you will see that your firms take out membership also.

As to the Association of Manufacturers itself, the fact that this body had representation at the organization meeting of the Metric

Association leads the officers of that body to count upon you as a part of us; and I hope that at this meeting your organization may see fit to become a member of the Metric Association. We want you with us. We have placed organization membership at a low figure (\$10 per annum) to show that we primarily wish the moral support of friendly organizations. In passing, I might point out that some organizations—The National Wholesale Grocers Association, and the Philadelphia Bourse, for instance, have gone further than mere membership, each of these bodies giving us a \$50 donation.

And now I think I hear some of you saying: "But what's behind the whole thing?" In answer I will say that the organization of the METRIC ASSOCIATION is a tangible expression of the opinion of practical men—engineers, chemists, grocers, druggists, merchants and a sprinkling of those "theoretical fellers," the teachers—that now is *the* psychological moment to throw over the archaic standards with which we have been wrestling all these years and to turn to the international language of commerce, *The Metric System*. We, who appreciate the value of the metric system, must educate our business friends, who do not yet understand its time-saving and its trade-getting qualities; and when these qualities are understood the transition from the old units to the new will be easily accomplished.

The officers of the Metric Association are a unit in the opinion that metric education must precede metric legislation. But they also believe that their metric propaganda plus the international calls of to-day will surely result in bringing all practical Americans to a realization of the fact that it is high time for this country of ours to throw off the shackles of an Elizabethan set of standards and to add our 110,000,000 people to the 437,000,000 already using the metric system.

PUBLICATION OF INFORMATION ON DETAINED IMPORTS OF FOOD AND DRUGS AT PORTS OF ENTRY.

The Bureau of Chemistry, Department of Agriculture, gave a public hearing in the building of the Bureau of Chemistry at Washington, D. C., on Tuesday, March 20, 1917, at 10 A.M., to consider the question of publishing data on the detention of food and drugs offered for import at ports of entry. Dr. Carl L. Alsberg presided.

What the department wished particularly to ascertain was the opinion of the trade upon the desirability of publishing such information, and the form of such publication, and also, as to whether or not such publication would injure a consignee importing goods from abroad who has had no opportunity of inspecting the same prior to their arrival and detention at ports of entry.

Representatives were present from the National Wholesale Druggists Association, the Philadelphia Drug Exchange, the Drug Trade Section of the New York Board of Trade and Transportation, the National Association of Retail Druggists, and a number of national food organizations. Briefs from various trade bodies were filed, also.

After an extended discussion of the subject from many angles, the consensus of opinion expressed seemed to be:

(1) That it was undesirable to publish information relative to detained shipments unless the shipments gave evidence of intentional and wilful violations of the law, when the facts should be made public, (2) that the Bureau of Chemistry should coöperate with a Committee on Standards to be named by the various national food and drug interests with the view of framing tentative standards and tests for imported food and drugs. It was shown that there was precedent for such coöperation in Government work, *e. g.*, Seed Department of Bureau of Plant Industry, (3) that all the methods and tests used by the Bureau of Chemistry should be made public so that importers could know in advance of ordering goods what standards to specify, (4) that the sampling and methods of examination of drugs should be made uniform at all the ports of entry, (5) that the Bureau of Chemistry coöperate with the food and drug trade in securing an amendment of the Federal Food and Drugs Act giving the importers the right of appeal to a court, preferably the Board of General Appraisers.

If practicable standards are framed and proper publicity is given them so that the foreign exporter and the domestic importer shall have full knowledge of the same, it was felt that better conditions would result and that there would be little or no necessity for publishing information relative to detained shipments.

Dr. Carl Alsberg, chief of the Bureau of Chemistry, would not, of course, commit himself as to the attitude of his department on these suggestions, but stated that he would give them careful consideration, and that he wanted the assistance and coöperation of the trade

represented by the food and drug industries. He will decide later what can be done.

J. W. ENGLAND.

POSSIBILITY OF THE COMMERCIAL PRODUCTION OF LEMON-GRASS OIL IN THE UNITED STATES.¹

BY S. C. HOOD, SCIENTIFIC ASSISTANT, DRUG-PLANT AND POISONOUS-PLANT
INVESTIGATIONS.

Lemon-grass oil is the volatile oil distilled from the plant known botanically as *Cymbopogon citratus* DC. and commonly called lemon grass. It is lemon yellow to brownish in color, with a strong odor resembling that of the lemon verbena, and for many years has occupied a prominent place in the perfume industry. The value of this oil depends almost entirely upon its content of citral, which is used in the manufacture of ionone, or artificial violet. Considerable use is also found for the oil in the soap industry.

The principal regions where lemon-grass oil is produced are the Travancore Province and Madras Presidency of India and the island of Ceylon. Small quantities are regularly produced in other parts of the East Indies, and from time to time in many other parts of the world.

Exact figures are not available regarding the consumption of lemon-grass oil in the United States, but estimates place it at about 100,000 pounds annually.

For the past eight years the Bureau of Plant Industry has been conducting experiments in the growing of lemon grass in central Florida, and during the course of the experiments field tests have been made with 13 varieties secured from eight different parts of the world.

SOIL AND CLIMATIC REQUIREMENTS OF LEMON GRASS.

The best results with lemon grass have been obtained on well-drained sandy loam, but this plant also does well on light sand, such as the high pine lands of the Florida peninsula. Newly cleared sandy pine land without the previous application of lime has also given good results. Soil which is poorly drained or underlain by hardpan

¹ Reprinted from Bulletin No. 442, Bureau of Plant Industry, U. S. Department of Agriculture.

within 3 feet of the surface should not be planted to lemon grass. Field tests have not been made on heavy clay lands, but the successful cultivation of the crop on that type of soil is regarded as doubtful.

The climatic requirements of lemon grass are subtropical. A winter temperature of 28° F. has killed the plants to the ground, while 24° has killed the roots. However, the crop may be planted with safety where the temperature does not fall below 25° F., and under certain conditions even a slightly lower temperature may not cause serious damage.

PROPAGATION.

Lemon grass does not produce seed in this country, although occasionally an abortive flower spike may be found on old, neglected plants. Propagation, therefore, is effected by division of the clumps. From each clump 25 to 50 divisions may be separated easily by tearing them off from the base of the mature plant. This should be accomplished by a sidewise pull, so that a few root fibers will be retained on each division. In case the old plants are to remain in their places the required number of divisions can be secured by pulling them off from the outer edge of the old clump. With a little practice these may be removed without loss of root fibers.

Before planting, the tops of the divisions should be cut back to about 3 inches. The plants should be set in the early spring in rows 3 feet apart and about 18 inches apart in the row. This work should be done just after a rain or at a time when the soil is sufficiently moist not to require artificial watering.

FERTILIZERS AND CULTIVATION.

The results obtained from experimental fertilizer plats seem to indicate that on the sandy Florida soils rather more potash is required by lemon grass than by most grasses. Analysis shows a considerable variation in the percentage of nitrogen, phosphoric acid, and potash present in the plants of the different varieties tested. The results secured with one variety, which may be taken as a type, show that 5 tons of lemon grass contain 20.32 pounds of nitrogen, 33.20 pounds of potash, and 18.75 pounds of phosphoric acid. In the fertilizer tests a better growth was secured when the potash was applied in the form of the sulphate, and the results were more satisfactory when part of the nitrogen was applied in organic form. In the tests which have been made a fertilizer having 4 per cent.

nitrogen, 5 per cent. potash, and 8 per cent. phosphoric acid, applied at the rate of 600 pounds to the acre, has given the best results with the least cost. On soils of higher fertility a smaller quantity could be used. Although the use of larger quantities of fertilizers will give a heavier growth, it is by no means certain that the additional cost will be met by the increase in the crop.

As soon as the plants have become well established in the field the fertilizer should be given as a side application and well worked in at the first cultivation. Cultivation should be frequent throughout the spring, to conserve the soil moisture, and throughout the summer all weeds should be kept down, as a few ill-smelling weeds in the crop at harvest time will greatly injure the odor of the oil. After the first year, only slight cultivation is needed, since after it is well established lemon grass tends to retard weed growth.

HARVESTING.

The first cutting should be made four or five months after planting, at which time the plants should be from 2½ to 3 feet high and the bunches from 8 to 10 inches in diameter. Although the plants will continue to grow throughout the summer, it has been found that after a certain size has been reached the increase in weight is less rapid; hence, it is more profitable to harvest the crop at the time stated and allow a new growth to develop. In the early fall of the first year a second cutting can be secured. After the first year the growth in the spring is more rapid and three harvests a year can be obtained. Harvesting can be accomplished by the use of a mowing machine so adjusted as to cut the plants about 8 inches above the ground. The cut material can be raked up with a horse-rake run crosswise of the rows.

In order to determine the proper stage and height at which the plants should be cut to produce the best yield and quality of oil, a number of tests were made, covering several years. In 1908 the plants were cut when they were 2 feet high. They were then tied in bundles, the bundles cut into three 8-inch lengths, and each portion distilled separately. The yield of oil obtained from each portion, together with the citral content of the oils, is shown in Table I.

From these results, which are borne out by additional data obtained in succeeding years, the conclusion is evident that close cutting will not be profitable, because of the low oil content in the lower portion of the plant.

TABLE I.

Yield and Citral Content of Lemon-grass Oils Distilled from Plants 2 Feet High.

	Yield of Oil.	Citral Content of the Oil. ²
Upper third	0.46	70
Middle third .....	.24	78
Lowest third .....	.10	82

For the purpose of determining whether the hauling cost could be reduced by drying the plants before taking them to the still, the following test was made: A quantity of fresh plants was collected, well mixed, and divided into three portions. The first portion was distilled green, the second portion was exposed to the sun for several hours until the blades were nearly dry, and the third portion was dried in a loft for several hours at 110° F. The two dried portions were then distilled separately and the yield of oil calculated on the original green weight of the material. The results secured, together with the citral content of the oils, are given in Table II.

These results show that there was considerable loss of oil by

TABLE II.

Yield and Citral Content of Lemon-grass Oils Distilled from Green and from Dried Plants.

Condition of Material.	Weight of Material (Green).	Weight of Material (Dried).	Yield of Oil (Based on Green Weight of Material).	Citral Content of the Oil.
	Pounds.	Pounds.	Per Cent.	Per Cent.
Fresh.....	78.1	...	0.37	78
Sun dried	93.1	58.3	.31	78
Artificially dried	100.3	62.7	.32	79

drying the plants. In the case of the sun-dried plants the loss on a 4-ton crop would be 4.8 pounds of oil, or, at the prices prevailing for 1915, a loss of \$3.84, which would more than pay for the extra hauling charge. Drying the plants seems to have no effect on the citral content of the oil, but on storing it was found that the solubility of the oil in alcohol diminished more rapidly in the oils from the dried material.

² The citral content throughout all the experiments was determined by the sodium-sulphite method.

DISTILLATION.

The apparatus required for the distillation of lemon-grass oil does not differ from that in general use for the distillation of other volatile oils. Before distilling the plants it has been found advisable to run them through a fodder cutter, in order to permit closer packing in the retort. From the data at hand it is estimated that if the plants are cut into 2-inch lengths a retort will hold 100 pounds of material for every 6 cubic feet of space, but if the plants are put in whole the quantity which the retort can hold will be somewhat less. The closer packing, however, in no way facilitates distillation.

In a retort having a capacity of 30 cubic feet a charge of 3,000 pounds can be distilled in 2 to 2½ hours by the steam which may be readily generated in a small farm boiler, and by the use of a larger volume of steam the time can be much reduced.

In this connection it is interesting to note that distillation under 20 pounds pressure in the retort increased the yield of oil, but gave an oil of very dark color and with lower citral content.

After the oil has been distilled it should be freed from water so far as possible in a separatory funnel, then dried by shaking with anhydrous calcium chlorid, and filtered. It should be stored in well-filled air-tight containers in as cold a place as possible until ready to be shipped to market. The shipping can be done in new and clean tin cans without injury to the product.

In order to determine whether any appreciable quantity of oil would be lost by discarding the distilled water coming over with the oil, a series of tests was made in 1915. The water from a number of charges of several pounds each was retained and each lot separately redistilled. In the apparatus used in the experiments about 1 gallon of water was secured for each 22 pounds of herb in the charge. The average of the results secured by the redistillation of this water showed that 1.2 gram of oil was dissolved in each gallon of water, a quantity too small to make its recovery profitable. Examination of this recovered oil showed its characteristics to be practically identical with the oil distilled directly from the herb.

VARIETIES.

During the many years that lemon grass has been cultivated a great variety of forms of the plant has been developed. Some years ago an attempt was made to divide the old species into two separate species, basing the descriptions partially on the character of the oil

secured from the two sorts. In the essential-oil trade it long has been recognized that there is a wide difference in the characteristics of lemon-grass oils from different regions. It is not the purpose of this paper, however, to discuss any questions of systematic relationship or nomenclature of the plant, but since a wide difference has been found in the commercial value of the strains under experimental cultivation, a brief discussion of these will be of interest to the prospective grower.

During the course of the experiments, plants were obtained from a number of sources, and altogether 13 different strains have been tested. Following are the sources of the various strains:

1. Secured from a nursery in Florida. The original stock was from Havana.
2. A local form sold in the Florida nursery trade.
3. Isle of Pines.
4. Porto Rico.
5. Cochin China.
6. Ceylon.
7. Mexico.
8. India.
9. India.
- 10, 11, and 12. Origin unknown.
13. Ceylon.

These 13 strains fall into the following classes as regards growth characteristics:

(1) The West Indian type, represented by Nos. 1, 2, 3, and 4. The plants are 2½ to 3 feet high, with lax, drooping leaves and of light color.

(2) The East Indian type, represented by Nos. 5, 8, and 9. The plants are 3½ to 4 feet high and erect. The leaves are rather erect and more scabrous than the West Indian form.

(3) The Mexican form, represented by No. 7. This is a weak form, very drooping in habit, with lax leaves and very light in color.

No. 6 has the typical West Indian appearance, but is markedly different in oil yield. No. 13 has the typical East Indian appearance, except the color, which is very light, almost yellowish. Nos. 10, 11, and 12 are of the approved East Indian type.

Table III shows the variations in the yield of oil and the citral content of the oil from these various types for the season of 1915.

It has been found year by year that there is considerable variation in both the yield of oil and the citral content, yet the figures given in Table III may be taken as representative of the varieties

mentioned. It will be noted that the Ceylon forms, Nos. 6 and 13, are very low in oil yield, and the same is true of No. 8, from India.

Both the yield of oil and the citral content of the oil have been found to be affected to a considerable degree by the type of soil on

TABLE III.

Yield and Citral Content of Lemon-grass Oils Distilled from the Various Plants under Cultivation in 1915.

Variety.	Yield of Oil.	Citral Content of the Oil.	Variety.	Yield of Oil.	Citral Content of the Oil.
	<i>Per Cent.</i>	<i>Per Cent.</i>		<i>Per Cent.</i>	<i>Per Cent.</i>
No. 1.....	0.24	80	No. 9.....	0.20	76
No. 5.....	.27	70	No. 10.....	.23	80
No. 6.....	.16	73	No. 11.....	.28	80
No. 7.....	.23	72	No. 12.....	.29	81
No. 8.....	.15	79	No. 13.....	.12	85

which the plants are grown. Therefore, before selecting a variety for commercial planting, tests should be made to determine which variety will give the highest yield of oil per acre and the highest citral content on the land to be used. The vigor of the plants should also be considered, since there seems to be a difference in soil requirements among the varieties tested.

FACTORS AFFECTING THE YIELD OF LEMON-GRASS OIL.

Soil Conditions.—In order to determine the effect of soil conditions on the yield of lemon-grass oil, tests were made in 1908 with the West Indian variety, No. 1, on soils containing various degrees of moisture. On light sandy soil of the high hammock type the yield of oil was 0.31 per cent. and on moist bottom land 0.27 per cent. Another test on sandy high pine land in a different location gave an oil yield of 0.35 per cent., and on moist land near the lake 0.28 per cent. Further tests with this variety under other conditions of soil moisture gave results which were also much in favor of the sandier and better drained land. In 1915 the plat devoted to the Ceylon variety, No. 6, showed a higher yield of oil from the plants grown on the high, well-drained, sandy soil than from the part of the plat which contained slightly more moisture, 0.16 per cent. being obtained from the former and only 0.11 per cent. from the latter. Similar results were secured in 1914 with varieties Nos. 5, 8 and 9.

The evidence thus far available indicates that for all the forms

of lemon grass tested, a heavy growth of herb with high oil content is to be expected on light, well-drained soil of the high pine type.

Time of Harvest.—Since lemon grass is a perennial crop and two or three cuttings can be made each year, it is of interest to note the difference in yield of oil secured from the plants at each harvest. In Table IV are given the results obtained from each of two harvests for various years.

TABLE IV.

Yield of Lemon-grass Oil Distilled from Plants Harvested at Two Different Times of the Year.

Year and Plants Harvested.	Yield of Oil.		Year and Plants Harvested.	Yield of Oil.	
	First Harvest.	Second Harvest.		First Harvest.	Second Harvest.
1908.	<i>Per Cent.</i>	<i>Per Cent.</i>	1914—Continued.	<i>Per Cent.</i>	<i>Per Cent.</i>
First plat.....	0.31	0.33	No. 8.....	0.12	0.38
Second plat.....	.40	.48	No. 9.....	.24	.36
Third plat.....	.20	.35	1915.		
1912.			No. 1.....	.27	.26
No. 1.....	.40	.36	No. 8.....	.11	.11
No. 8.....	.28	.46	No. 9.....	.19	.17
1914.			No. 10.....	.23	.47
No. 1.....	.37	.50	No. 11.....	.28	.40
No. 5.....	.34	.35	No. 12.....	.29	.31
No. 6.....	.16	.20	No. 13.....	.12	.27

These results show that in general the percentage of oil is higher in the second cutting. In the first year of planting, however, the quantity of herb obtained in the second cutting is much less than that from the first cutting; consequently, the acre yield of oil in the first year would be greater from the first cutting rather than from the second.

FACTORS AFFECTING THE CITRAL CONTENT OF LEMON-GRASS OIL.

Closeness of Cutting the Plants.—Experiments conducted with variety No. 1, grown on very light sandy soil, showed that the citral content was highest in the part of the plant nearest the ground. Large plants divided into three portions yielded, on distillation, oil with citral content as follows: Upper portion, 70 per cent.; middle portion, 78 per cent.; and lowest portion, 82 per cent. A similar test made with variety No. 5 divided into only two portions yielded oil with citral content in favor of the lower portion, as follows:

Upper portion, 74 per cent.; lower portion, 76 per cent. These results show that the closest cutting which gives a profitable yield of oil also produces a better quality of oil.

Soil Moisture.—Plants of variety No. 1, grown on soils having varying degrees of moisture, yielded oil with citral content as follows: On dry sandy soil, 75 per cent. citral; on slightly moist sandy loam, 68 per cent.; and on moist loam near the lake, 66 per cent. Further tests with other varieties on different types of soil have given similar results. This would indicate that high citral content can be secured only from plants grown on very well drained soil.

Time of Harvest.—Although the citral content of the oil does not appear to be greatly affected by the time of harvest, the results indicate that of the two harvests each year the oil distilled from plants of the first harvest contains the greater quantity of citral. Data covering a number of years are given in Table V.

TABLE V.

Citral Content of Lemon-grass Oil Distilled from Plants Harvested at Two Different Times of the Year.

Year and Plants Harvested.	Citral Content of Oil.		Year and Plants Harvested.	Citral Content of Oil.	
	First Harvest.	Second Harvest.		First Harvest.	Second Harvest.
1908.	<i>Per Cent.</i>	<i>Per Cent.</i>	1914—Continued	<i>Per Cent.</i>	<i>Per Cent.</i>
First plat.....	72	74	No. 8.....	81	72
Second plat.....	74	72	No. 9.....	75	59
Third plat.....	75	72	1915.		
1912.			No. 5.....	70	68
No. 1.....	76	78	No. 6.....	73	71
No. 8.....	78	76	No. 8.....	77	64
1914.			No. 9.....	78	70
No. 1.....	78	..	No. 10.....	80	74
No. 5.....	78	76	No. 11.....	80	82
No. 6.....	77	79	No. 12.....	81	80
			No. 13.....	85	82

SOLUBILITY OF LEMON-GRASS OIL IN ALCOHOL.

For many years it was considered that good lemon-grass oil should be soluble in clear solution in three volumes of 70 per cent. alcohol, and this was the test applied before the method of citral determination was in general use. It served a useful purpose, however, inasmuch as certain adulterations which had become quite

general could thus be detected, but at the present time, when the valuation of the oil is entirely on the basis of the citral content, it is difficult to understand the reason for the continued use of the solubility test. It has been shown repeatedly that in many parts of the world pure lemon-grass oil does not pass the solubility test, especially after it has been stored for several months. This has been true of most of the samples of the oils produced in the Western Hemisphere, so that West Indian lemon-grass oil has come to be a synonym for insoluble oil. This discrimination has kept out of the market many West Indian oils of very high citral content.

There has been much discussion regarding the factors which affect the solubility of the oil, it having been contended that the length of time of distillation is the controlling factor. In order to secure data upon this point the following tests were made: In 1914, 158 pounds of the freshly cut plants were distilled with steam and the oil drawn off in fractions at intervals of 45 and 60 minutes, respectively. The first fraction represented a yield of oil of 0.28 per cent., the citral content of the oil being 80 per cent., while the second fraction represented a yield of 0.04 per cent. of oil, with a citral content of 85 per cent. When first distilled the first fraction gave a slightly cloudy solution with three volumes of 70 per cent. alcohol, but after two months it gave a very cloudy solution in all volumes of 70 per cent. alcohol. The second fraction was soluble with clear solution in three volumes of 70 per cent. alcohol, showing no sign

TABLE VI.

Citral Content and Solubility in 70 Per Cent. Alcohol of Various Fractions of Lemon-grass Oil.

Fractions.	Yield of Oil.	Citral Content of Oil.	Solubility in 70 Per Cent Alcohol.
	<i>Per Cent.</i>	<i>Per Cent.</i>	
First 15 minutes . . .	0.21	39	Soluble with very cloudy solution in two volumes and over.
15 to 30 minutes . . .	.21	74	Soluble in clear solution in two volumes and over.
30 to 50 minutes . . .	.05	82	Do.
50 to 90 minutes . . .	.01	80	Do.

of change after two months. Another sample of 203 pounds of the fresh plants distilled with steam and the oil drawn off in fractions at intervals of 15, 30, 50, and 90 minutes, respectively, gave the results shown in Table VI.

From the results shown in Table VI it is evident that complete extraction of the oil gives a product of greater solubility and higher citral content.

The oils produced in Florida from all varieties of the plant have passed the solubility test when first distilled, but after storing for three months all have become insoluble. At the present time there is a decided tendency to disregard the solubility test, and no difficulty has been encountered in selling the Florida oils at a good price when the citral content was 70 per cent. or more.

COMMERCIAL POSSIBILITIES.

The consumption of lemon-grass oil in the United States for the manufacture of ionone and for perfumery purposes is continually increasing, and it is believed that the demand is sufficient to warrant an attempt to grow the plant for the commercial production of the oil in such parts of the country as possess the proper climatic requirements. Tests on acre plats have been made to determine the cost of production, the best methods of distilling the oil, and the quality of the product. Samples of the oil produced have been sold on the market at the prices prevailing for the better grades of imported oil, and it seems possible to produce the oil commercially at a fair profit.

From the experiments made thus far the following estimates are given of the cost of production and the returns that may be expected for this crop under average conditions:

Expenditures.

First year (per acre) :

Preparing the land	\$ 3.00
Planting	2.00
Fertilizers	8.00
Cultivation	2.00
Harvesting and distilling	5.00
Total expenditures, first year	<u>20.00</u>

Succeeding years (per acre) :

Cultivation	\$ 1.00
Fertilizers	8.00
Harvesting and distilling	8.00
Total expenditures, second year and succeeding years ..	<u>17.00</u>

Returns.

First year: 25 pounds of oil per acre, at 80 cents	\$20.00
Succeeding years: 35 pounds of oil per acre, at 80 cents	28.00

In these statements no allowance is made for such charges as taxes, insurance, interest, or depreciation of outfit. It is doubtful whether the production of lemon-grass oil would be profitable if all overhead charges were placed against this crop alone, since the distilling plant would be in use only a few weeks in a year. However, if grown in connection with other volatile-oil plants, so that a long distilling season would be secured, it is believed that this crop will yield returns comparing favorably with other crops grown on the same type of land.

THE PHILADELPHIA DRUG EXCHANGE.

The annual meeting of the Philadelphia Drug Exchange was held on Tuesday, January 23, 1917, in its rooms in the Bourse Building and the work of the year reviewed. Mr. Clayton F. Shoemaker, Chairman of the Committee on Legislation, presented on behalf of the Board of Directors, the fifty-sixth annual report detailing the general conditions of business with special reference to the interests of the drug and chemical trade and the rapid growth in exports by reason of war conditions. Treasurer Anthony M. Hance presented the financial report for the year.

The following officers were elected for 1917: President, John Fergusson; Vice-President, Harry B. French; Secretary, Joseph W. England; Treasurer, Anthony M. Hance; Directors: Charles E. Hires, A. Robinson McIlvaine, Dr. Adolph W. Miller, Harry K. Mulford, Adam Pfromm, Clayton F. Shoemaker, Richard M. Shoemaker and Walter V. Smith.

Addresses were made by Mr. Adam Pfromm, Mr. Walter V. Smith and Mr. Geo. E. Bartol, President of the Philadelphia Bourse. Mr. Alexander C. Ferguson, formerly of Fergusson Bros., who has been actively identified with the drug brokerage and commission business of Philadelphia for more than fifty years, and for a number of years was Secretary of the Drug Exchange, made an address replete with interesting incidents of the development of the Exchange since its organization in 1861. By recent action, the Board of Directors decided against a propaganda for the adoption of the metric

system at this time, by reason of the existing war conditions, urging that action be postponed until the business conditions of the country have again become normal.

The annual dinner was held on Thursday evening, January 25, 1917, at the Bellevue Stratford Hotel, 150 members and guests being present. Mr. Clayton F. Shoemaker acted as toastmaster. The Committee on Entertainment, Mr. Walter V. Smith, Chairman, presented a most enjoyable vocal and instrumental program, while the addresses were of an unusually high character. The speakers were: Dr. John G. Wilson, Superintendent of the Northwest District, Philadelphia Conference, M. E. Church; Mr. Thomas A. Daly, Author of Tom Daly's Column of the Philadelphia Ledger, Mr. Ernest T. Trigg, the recently elected President of the Philadelphia Chamber of Commerce, and Dr. William E. Hughes in an address of "Japan of To-day," illustrated by lantern slides.

At the Annual meeting the death of Ernst T. Fritzsche, senior member of Schimmel & Co., distillers of essential oils and manufacturers of fine chemicals, died on December 21st, at Leipsig, Germany. Mr. Fritzsche was in his sixty-sixth year. Details regarding the life of Mr. Fritzsche are not available, owing to the unusual conditions resulting from the war.

OBITUARY.

PROF. C. LEWIS DIEHL.

Though the failing health of Professor Diehl had been a matter of concern for several months, his many friends and associates were shocked when the news came of his death on Sunday, March 25th, and thus left another gap in the ranks of the "Old Guard" of Pharmacy's brilliant lights. His long association with the profession and his sincere and continued interest in all matters pertaining thereto, gave him not only a national but an international reputation, and his presence will be missed at the Annual Meetings of the American Pharmaceutical Association and the Kentucky Pharmaceutical Association, where for years his familiar figure was unfailingly in evidence.

C. Lewis Diehl was born at Neustadt, Rhenish Bavaria, Aug. 3, 1840; his father was chief executive in one of the revolutionary districts, and owing to political conditions, was forced to take refuge in France in 1848, from where he emigrated to America in 1849; his wife and three children following him in 1851. The family took up their lives in the New World upon a farm near St. Louis, Mo., where the wife and mother died in 1852 and the farm was abandoned. Young C. Lewis was sent to Oakfield Academy at St. Louis, where he remained for two years, leaving to join his father in Philadelphia, Pa.

At the age of fourteen, he secured his first position with Messrs. R. & G. A. Wright, Perfumers, remaining with them for three years, then going to Chicago. The financial panic of that year (1857) compelled young Diehl to resort to various means of livelihood, but he remained in Chicago until the following year, when he again returned to Philadelphia and became apprenticed to John R. Agney, Spruce and Fifth Sts., Philadelphia; here he laid the foundation of that life's work, to which he gave so much enthusiasm and energy in all his remaining years.

Graduating from the Philadelphia College of Pharmacy in March, 1862, he entered the employ of Messrs. John Wyeth & Bro., assuming charge of their new and extensive manufacturing laboratory. His unflagging energy and unusual attainments were largely instrumental in making the venture successful from the start.

The call of his adopted country was answered by his enlistment in the famous Anderson Cavalry and he remained in the service until the battle of Stone River, where he was severely wounded and was given his discharge.

Joining his father, in Chicago, he remained with him for several months, recuperating from his wounds, only again to enter the Government service, as Assistant Chemist in the United States Army Laboratory at Philadelphia, which position he secured through the recommendations of Messrs. Wyeth & Bro. and the late Prof. John M. Maisch.

The termination of the war being evident, on January 1st, 1865, Mr. Diehl resigned his position and desiring to locate permanently, he went to Chicago with the intention of purchasing a store, but on receiving an offer from the firm of Bender, Mahle & Co. (afterward Mahle & Chappel), he entered their employ only to remain until the following July; leaving to accept the management and re-

organization of the Louisville Chemical Works at Louisville, Ky., a concern originated by Dr. E. R. Squibb and Prof. J. Lawrence Smith, but at that time operated in the interest of Messrs. Wilson, Peter & Co.

The first store owned and operated under his own name was purchased by Mr. Diehl in June, 1869, and was located at First and Walnut Sts., Louisville, Ky., moving in 1874 to Third and Broadway, where he continued in business until his retirement to private life (1904).

Joining the American Pharmaceutical Association in 1863 at the Baltimore meeting, he attended his first meeting at Detroit in 1866, when he was elected Chairman of the Committee on Progress of Pharmacy, a position to which he was re-elected in 1867. In 1871 Professor Diehl was elected First Vice President of the Association and at the Louisville meeting in 1874 he became its President.

A volunteer report on the Progress of Pharmacy submitted in 1872 met with so much approbation and commendation that the Association elected him to the newly created office Reporter on Progress of Pharmacy, a position which he occupied almost continuously until the San Francisco meeting of 1915, when failing health rendered his retirement necessary.

The Louisville College of Pharmacy owes its organization to Professor Diehl and others whom he interested in it; he was its first President and from 1870 to 1881 continued to preside over its destinies; he also occupied the chair of Pharmacy until 1886, with the exception of the sessions of 1881-2 and 1882-3; resigning on account of a throat affection.

His Alma Mater, the Philadelphia College of Pharmacy, conferred the richly merited degree Master in Pharmacy upon him in 1887.

The organization of the Kentucky Board of Pharmacy was largely owing to his unfailing energy, and he was a member of that body for the first six years of its existence and afterward at frequent intervals until the time of his death.

His Chairmanship of the National Formulary Revision Committee, his association on the U. S. P. Revision Committee and other pharmaceutical honors would fill more space than is allotted in this brief sketch, but it is to be hoped that a complete list of his published works will be searched out and tabulated.

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CONCERNING THE U. S. P. STANDARD FOR PITUITARY EXTRACT (LIQUOR HYPOPHYSIS).

BY CHARLES R. ECKLER.

The United States Pharmacopœia places a physiological standard requirement for pituitary extract (liquor hypophysis) which reads as follows:

"One mil of solution of hypophysis, diluted 20,000 times, has the same activity on the isolated uterus of the virgin guinea pig as a 1:20,000,000 solution of beta-imidazolethylamine hydrochloride when tested as directed by the United States Hygienic Laboratory."

Attention has been called to the fact that this is an exceedingly low requirement, but the correctness of the figures in the statement have not been questioned. The results of my work in the subject are so utterly at variance with the pharmacopœial statement that I am prompted to question whether or not the requirement as stated is correct. My question is this: should the equivalent of 1:20,000,000 B-imid be 1:20,000 or 1:200,000? In order to show my grounds for raising this question, I wish to briefly describe my apparatus (a detailed description of which will appear in another paper), to give in detail the method and procedure of making the dilutions, together with my results in general as to the relative activity of the two substances in causing contractions of the isolated guinea pig uterus.

APPARATUS.

The apparatus used is similar to, and was fashioned after, that described by Dale and Laidlaw (1), and is in principle essentially like that used by Roth (2). It consists of an amber-glass, 100 Cc. graduated chamber for holding Locke's solution, in which the uterus

is immersed, surrounded by a water bath kept warm by an immersed, painted-black, carbon lamp. From an elevated container Locke's solution is passed down through a coil in the water bath (thereby warming it as needed) and up into the amber chamber, filling the chamber from the bottom, at which place there is also an outlet. Warmed air (warmed by passing through another coil in the bath) is made to gently bubble through the Locke's solution, thereby keeping it aerated and circulating. The water in the outer bath is also kept circulating by a current of air in order to maintain an even temperature throughout the bath. The amber chamber bears a cork stopper at the top carrying a thermometer, and the tube conveying the air and to which the uterus is attached. The stopper has two holes, one for the thread to the writing lever, and one through which to inject the pituitary solution. In this all-glass apparatus light is practically excluded from the uterus, except for that which passes through the amber glass, and at the same time all the contents may be readily observed, rendering easier the control of dilutions, temperature, emptying of the chamber, rate of air flow, and so on.

MATERIAL.

The uteri of virgin guinea pigs weighing from 175 to 250 grams have been commonly used. Larger pigs, up to 300 grams, have usually furnished less satisfactory uteri.

METHOD AND PROCEDURE.

The animal is killed by instantaneous decapitation. The whole uterus, with a small section of vagina but without ovaries, is removed and placed in a fold of cotton saturated with warm Locke's solution until a horn can be separated, attached to the tube, and placed in the chamber. The vaginal end of the horn is tied to a little post on the air tube by means of a silk thread, which is sewn into the peritoneal covering on the side of the broad ligament. The ovarian end of the horn is attached to the thread running to the writing lever by a small pin hook which is passed through the Fallopian tube, or, if the horn is unusually long, a part of the ovarian end is removed and the hook is passed through the peritoneal fold as before. The tube bearing the uterus is then placed in the chamber, the thread attached to the writing lever, the uterus weighted down with from 1 to 4 grams (usually $1\frac{1}{2}$ to 3), the writing lever brought

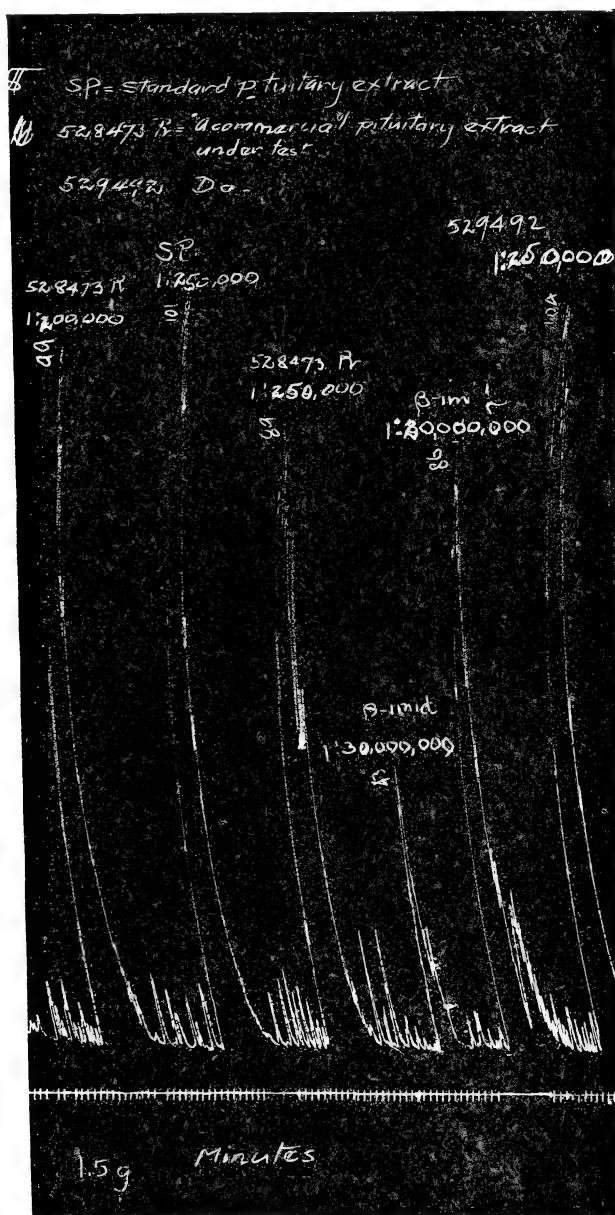


FIG. 1. Kymographic tracings comparing a standard pituitary extract with commercial extracts.

to the drum, and the air tubes connected, the temperature having been previously adjusted to between 37.5 and 39.5° C.

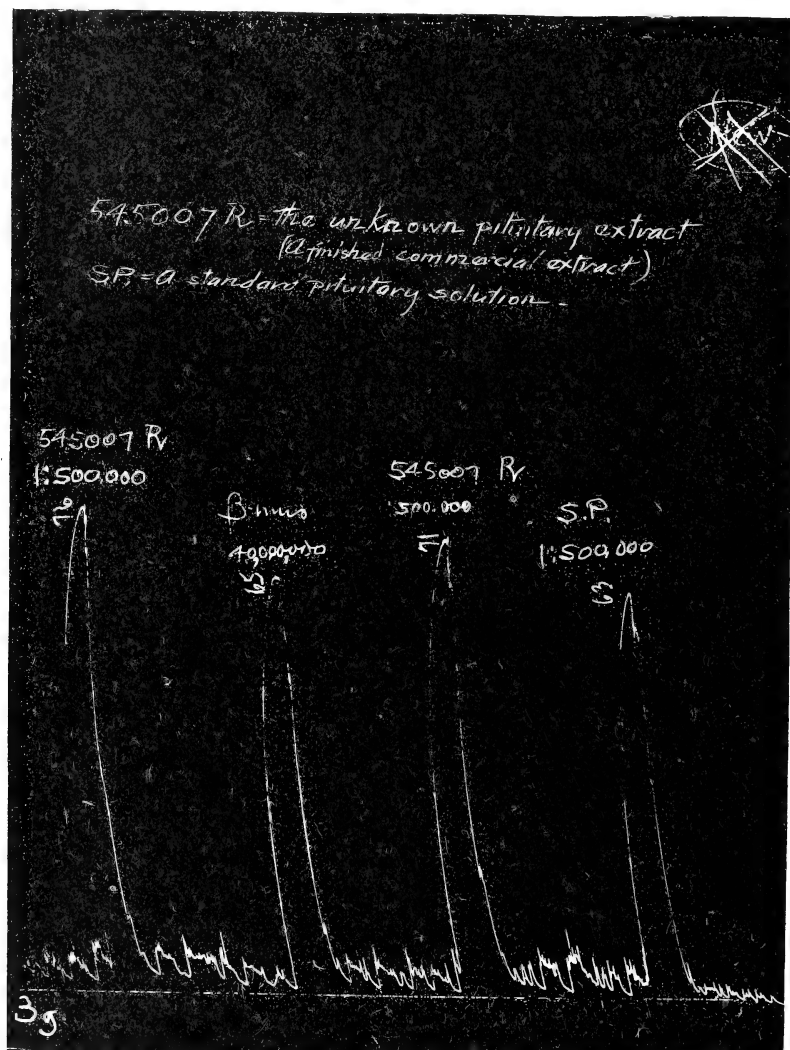


FIG. 2. Kymographic tracings of an unknown pituitary extract compared with a standard solution.

After spontaneous movements have appeared, usually after about half an hour, the application of pituitary extract dilutions are begun

and are repeated every twenty to thirty minutes, depending upon the time required for relaxation by the given organ, approximately the same period of application being maintained for each uterus throughout the experiment. A dilution of the pituitary solution is sought which will produce contractions equal to those recorded under the standard.

MANNER OF MAKING DILUTIONS.

It should be understood that when "pituitary extract" is mentioned in this paper the commercial solution is referred to. The dilutions are made as follows: .1 Cc. of the pituitary extract or solution is drawn from the ampoule by means of a narrow pipette and diluted with distilled water to 100 Cc. in a volumetric flask. This makes a 1:1,000 dilution. I use distilled water in this place, believing that the dilution so made will not lose strength materially during the experiment of five or six hours. The deterioration of pituitary extract in Locke's solution has been mentioned by Fenger (3). When it is desired to apply say a 1:200,000 dilution to the uterus, .5 Cc. of this 1:1,000 dilution is drawn off and added to the 100 Cc. chamber. The Locke's solution in the chamber is kept at such a height that when the pituitary dilution is added, the 100 Cc. mark will have been approximately reached. If a trifle more Locke's solution is needed, it is allowed to flow gently into the chamber from the reservoir. The dilutions of pituitary extract are measured out with a narrow pipette into a small, conical, glass cup and diluted with enough Locke's solution to make about 1 Cc. From this glass the dilution is taken up with a "Record" syringe having a long needle, and introduced into the chamber, the glass and syringe being afterward rinsed with another 1 Cc. of Locke's solution.

The beta-imidazolyethylamine hydrochloride was supplied by the Hoffman-La Roche Co. .05 gram of this substance taken from the 1 gram vials as supplied, without desiccating (being apparently dry), is placed in a sterile 500 Cc. volumetric flask and dissolved in freshly boiled and cooled distilled water containing a small amount of acetoform and made up to mark. This 1:10,000 dilution is sealed in ampoules and kept in a refrigerator in the dark. It seems to keep, thus, for many months without noticeable deterioration. For use 10 Cc. are diluted to 100 Cc. in a volumetric flask.

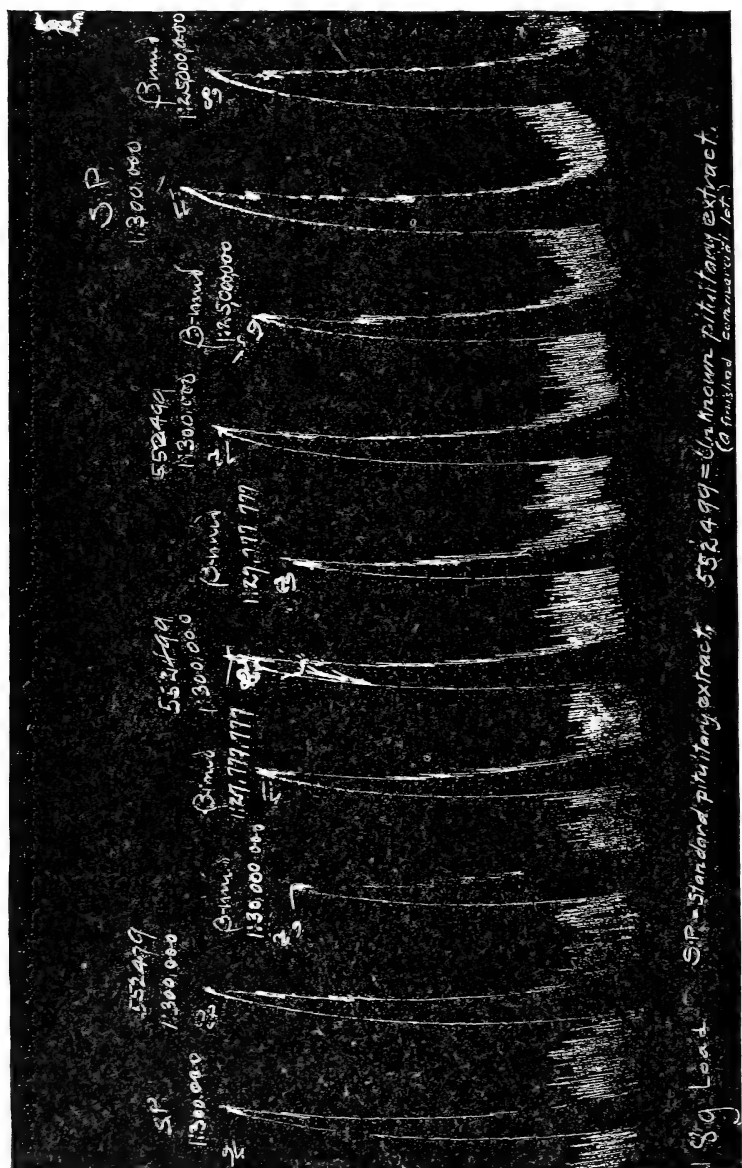


FIG. 3. Kymographic tracings comparing an unknown pituitary extract, a solution of beta-imidazole/ethylamine hydrochloride with a standard pituitary extract.

Of this 1:100,000 dilution .2, .25, .4, or .5 Cc. are added to the 100 Cc. chamber containing the uterus when a dilution of 1:50,000,-000, 1:40,000,000, 1:25,000,000, or 1:20,000,000 respectively is desired.

COMPARATIVE ACTIVITY.

During the past three years I have made over 500 kymographic tracings of the isolated uterus in testing pituitary glands, solutions, and finished commercial extracts made in this laboratory and also in others, and during this experience I have never found it necessary to apply as low a dilution as 1:20,000 of any commercial extract within the age limit. Indeed, it is rare that I ever apply a 1:100,000 dilution. The uteri on the average have required dilutions of from 1:160,000 to 1:600,000, occasionally 1:800,000 to 1:1,000,000, and rarely 1:2,000,000. This fact by itself is not of much importance, since some uteri are extremely sensitive, but it is significant in connection with the fact that my dilutions of B-imid effective on these same uteri have been about that directed in the pharmacopœia, that is, usually from 1:16,000,000 to 1:40,000,000. Occasionally a greater dilution of B-imid has been necessary but rarely a lesser. My experience with first-class pituitary extracts has led me to adopt as a standard requirement that a 1:250,000 dilution should equal 1:20,000,000 B-imid. (This dilution of the extract has no reference to the amount of gland contained, but means 1 part of finished extract as drawn from the ampoule to 250,000 parts of Locke's solution.) In order to illustrate this relationship, a few self-explanatory tracings are reproduced at the end. As evidence that this is about what one would expect of a carefully prepared pituitary extract, let us consider the following:

Fenger (3), in testing fresh posterior lobes from full grown cattle and calves, found the following dilutions of a 5 per cent. solution to be equivalent to 1:20,000,000 B-imid solution:

Full-grown cattle	1:38,000
Calves	1:40,000

Let us use the 1:40,000 dilution for convenience. Since 1 part of a 5 per cent. solution of fresh posterior lobe diluted 40,000 times is equivalent to 1:20,000,000 B-imid, then the fresh lobe itself would be equivalent to this standard in a dilution twenty times as great, or 1:800,000. Now if a commercial extract were made from such material, without loss of activity, so as to represent .2 to .3 grams of fresh lobe per 1 Cc. (which is about what commercial preparations represent), then we should expect such an extract to be equivalent to the standard in two tenths to three tenths as great a dilution, or 1:160,000 to 1:240,000.

Roth (4) gives a table in which he states that a 1 : 1,000,000 dilution of fresh posterior lobe from a steer is equivalent to 1 : 20,000,000 B-imid. (Although he says in his heading "Concentration of Extract," it is assumed that he actually means concentration of fresh posterior lobe, since in a previous paragraph he states "the amounts mentioned in the following tables are in terms of fresh material.") Reasoning from these figures, if a commercial extract were made from such material as the steer's lobe here mentioned, without loss of activity, so as to represent .2 to .3 gram per 1 Cc., then we should expect such an extract to be equivalent to the standard in two tenths to three tenths as great a dilution, or 1 : 200,000 to 1 : 300,000. It may be noticed that these figures compare favorably with those I have obtained in testing first-class commercial extracts. If finished commercial extracts are equivalent to the standard in dilutions of only 1 : 20,000, as stated in the U. S. P., what is the explanation of this great difference? Are manufacturers suffering a loss in activity amounting to 90 per cent. or more, due to their manufacturing processes? Why is it that extemporaneous preparations as made by Roth and Fenger will show ten to fifteen times as great activity as is shown by carefully made commercial preparations? Is this, in truth, the case, or is the standard as stated at fault? From my experience I would say that the pharmacopœial standard for liquor hypophysis is about one tenth that of average commercial pituitary extracts. These pituitary extracts have been on the market for several years and have been used by physicians everywhere, who have become familiar with their degree of activity and have become accustomed to giving certain doses. It seems advisable, therefore, that instead of lowering the activity of pituitary extracts to meet the U. S. P. requirement, the U. S. P. requirement should be raised so as to compare favorably with these preparations which have become so well known.

Finally, I wish to express my obligation to Dr. A. L. Walters, under whose supervision this work has been carried out.

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DEPARTMENT OF EXPERIMENTAL MEDICINE,

ELI LILLY & Co., INDIANAPOLIS, INDIANA.

FURTHER NOTES ON THE GERMINATION OF BELLADONNA SEED.¹

BY A. F. SIEVERS, CHEMICAL BIOLOGIST, OFFICE OF DRUG-PLANT AND POISONOUS-PLANT INVESTIGATIONS, BUREAU OF PLANT INDUSTRY, U. S. DEPARTMENT OF AGRICULTURE.

Several years ago² the writer made a study of the germination of belladonna seed with the object of determining the causes of the numerous difficulties encountered in germinating this seed. The conclusions drawn from that investigation may, for the sake of convenience, be briefly summarized as follows: (1) Freezing accelerates germination; (2) there is no apparent relationship between the size of the seed and its germinating power; (3) heavy seed germinates much better than light seed; (4) color is no criterion of the value of the seed; (5) treatment with sulphuric acid, while it has a slight accelerating effect, does not increase the percentage of germination; (6) treatment with hydrogen peroxide was found to be of material benefit; (7) scratching the seed coats by mechanical means is only of little value.

The great increase in the domestic cultivation of belladonna in the last few years has naturally brought the problem of securing sufficient good seed into prominence. Questions regarding the time of seed collections, the methods of handling the seed after picking, and the effect of such methods on the vitality of the seed are of prime importance. The belladonna plant presents special problems in this respect in that the seed is borne in succulent berries which, if gathered in the fresh state, require a long time to dry. This raises the question as to whether the seed is best collected when the berries are ripe and fresh or when they have dried on the plant. With a view toward throwing some light on these questions the following experiments were performed.

COLLECTION OF THE SEED.

Four typical first-year belladonna plants were staked and labelled as Nos. 1, 2, 3, and 4. When the majority of the berries were ripe

¹ Published by permission of the Secretary of Agriculture.

² The Germination of Belladonna Seed. This JOURNAL, November, 1914, p. 483.

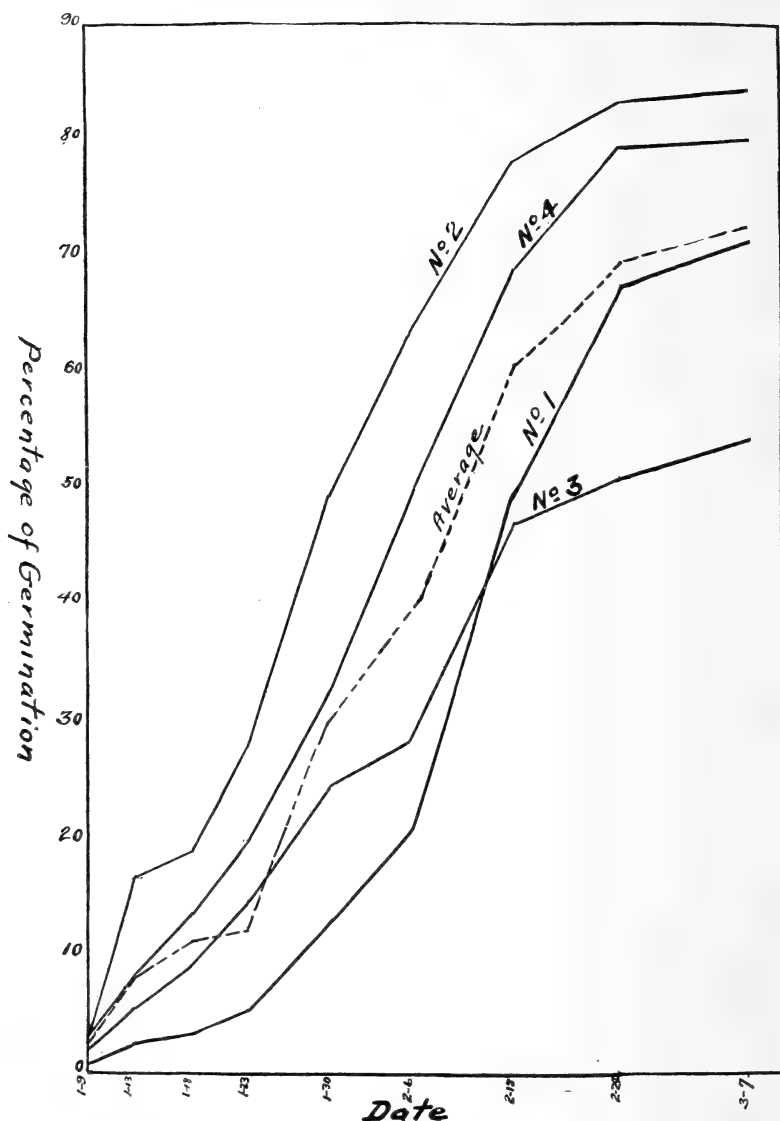


FIG. 1. Germination of Lot A.

a portion of them was picked separately from each of the four plants and each portion divided into two parts, *A* and *B*. At a later date, when the berries had all dried on the plants and the plants had been killed by frost, another portion was picked from each individual. This constitutes Lot C.

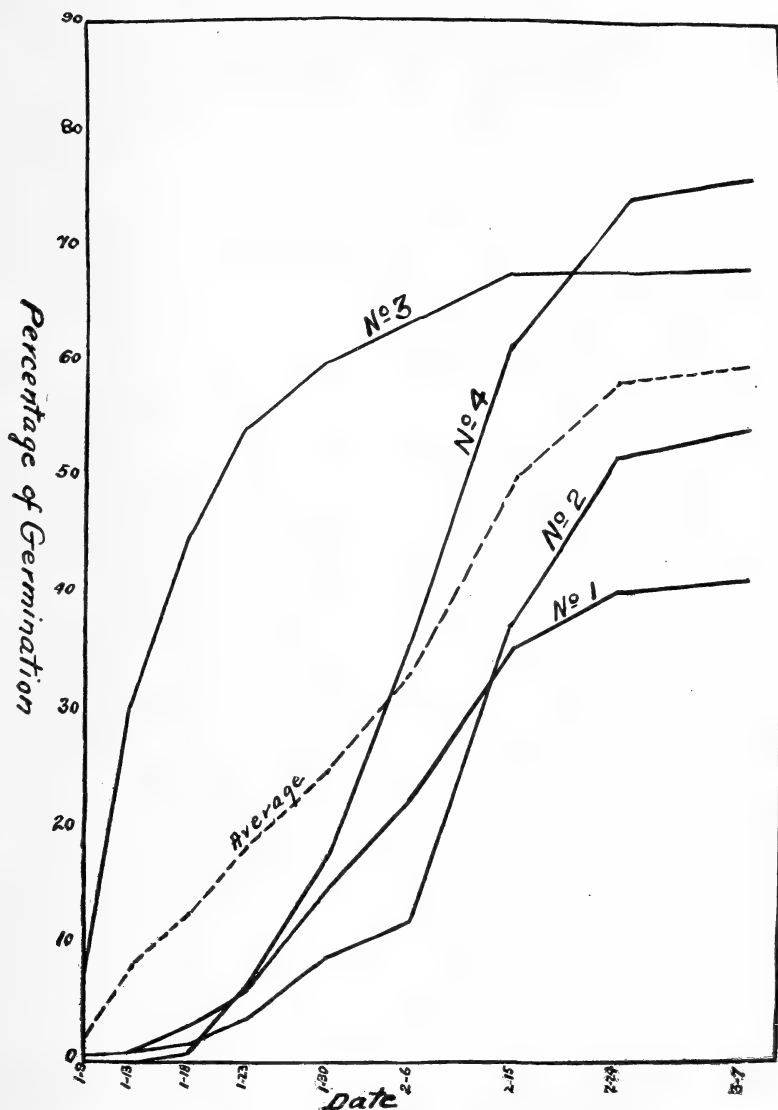


FIG. 2. Germination of Lot B.

METHODS OF TREATING THE SEED.

Lot A was brought into the laboratory and the seed washed out of the pulp by rubbing the berries on a No. 10 sieve. The seed

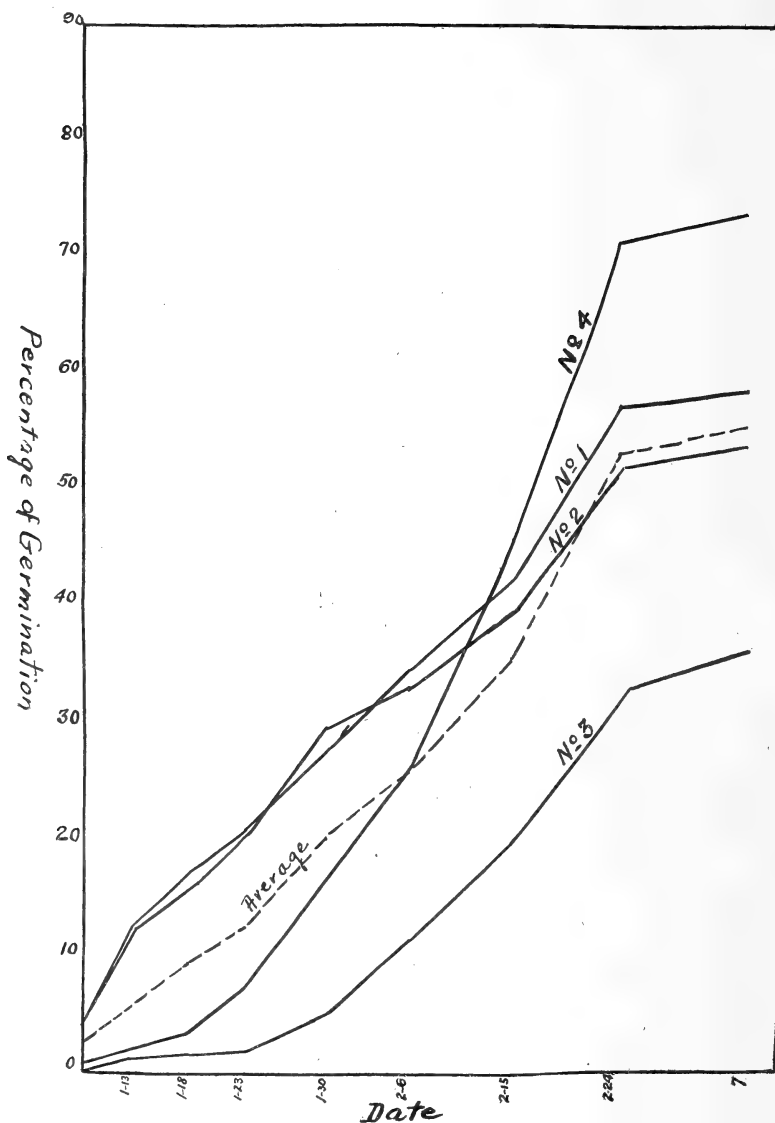


FIG. 3. Germination of Lot C.

passes through this sieve while most of the pulp and all the skins remain behind. After passing through such a sieve several times with the use of water the seed is practically clean. The seed was

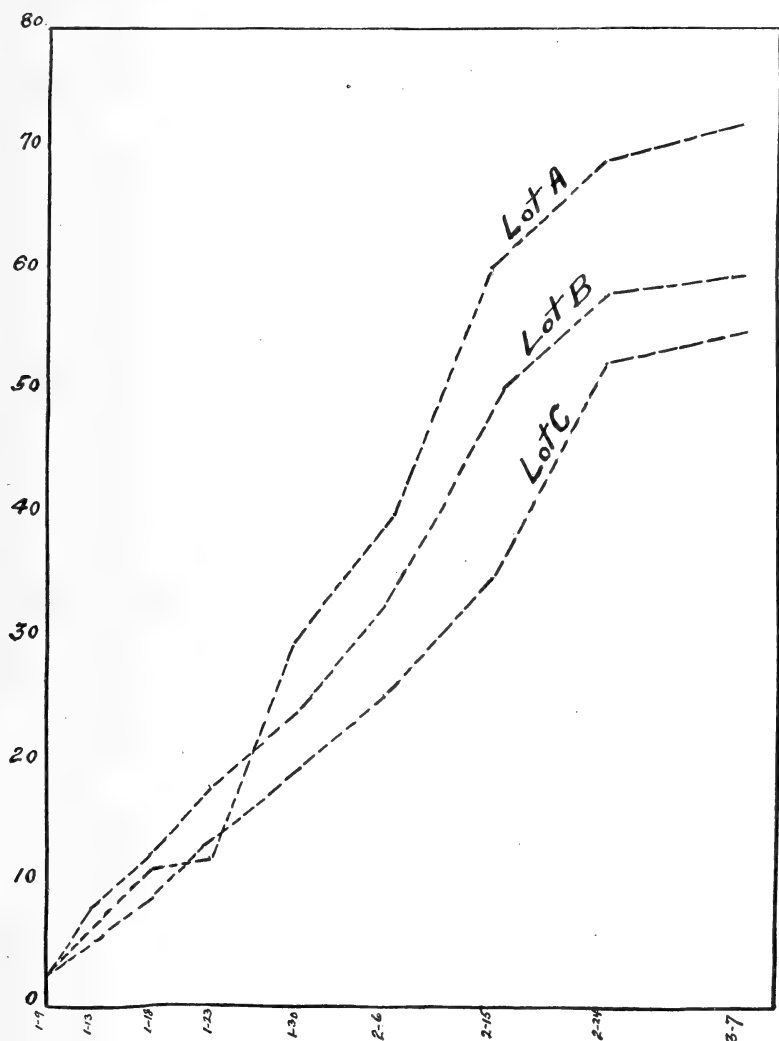


FIG. 4. Average germination of the three lots.

then placed in a Gooch crucible and by means of suction were dried in a very short time.

Lot B was placed in flat dishes and allowed to stand in the laboratory for several weeks. The berries became much decomposed and developed a considerable growth of mold. When in this condition the seed was separated in a way similar to that described under Lot A.

The seed in Lot C was readily separated from the pulp and skins by crushing the dry fruit and rubbing the seed through a sieve. It was further cleaned by fanning and further sifting.

RELATIVE WEIGHT OF THE SEED.

The opinion has been expressed that seed allowed to remain on the plant until the fruit has dried is larger than that removed sooner. Whether such is the case the writer is not prepared to say. It was shown, however, in the previous investigation that size of the seed has no apparent influence on the germination, although it may have some effect on the quality of the plant produced. The same investigation established the fact, however, that the weight of the seed is an important factor in its germination. Since it is a difficult matter to determine the relative size of several portions of seed, and since as a general rule greater size is indicative of greater weight, an attempt was made to determine the relative weight of these various lots of seed. This was done by weighing five portions of 100 seeds each and multiplying the average by 10 to determine the weight of 1,000 seed. In the following table the results are tabulated.

TABLE I.

Table Showing the Relative Weight of Seed from the Individual Plants from Each Lot.

Lot.	Treatment.	Number of individual plant.	Weight of seed (grams).						Average weight of 1,000.	Average weight of 1,000 seed from whole lot.
			First 100.	Second 100.	Third 100.	Fourth 100.	Fifth 100.	Average.		
A ..	Picked when berries were fresh and seed washed out at once	1	0.1028	0.1019	0.1036	0.1009	0.1036	0.1025	1.025	1.030
		2	.1044	.1026	.1034	.1037	.1017	.1031	1.031	
		3	.1038	.1076	.1057	.1029	.1031	.1046	1.046	
		4	.1012	.1027	.1054	.1013	.0993	.1019	1.019	
B ..	Picked when berries were fresh and allowed to mould	1	.0971	.0986	.0940	.0987	.1033	.0983	.983	.952
		2	.0920	.0923	.0897	.0924	.0921	.0917	.917	
		3	.0978	.0993	.1003	.0953	.0949	.0975	.975	
		4	.0934	.0971	.0971	.0952	.0958	.0947	.947	
C...	Picked when berries were ripe	1	.0943	.0976	.0994	.0994	.0973	.0972	.972	.928
		2	.0936	.0933	.0942	.0922	.0913	.0929	.929	
		3	.0903	.0876	.0890	.0935	.0889	.0898	.898	
		4	.0878	.0948	.0923	.0871	.0933	.0910	.910	

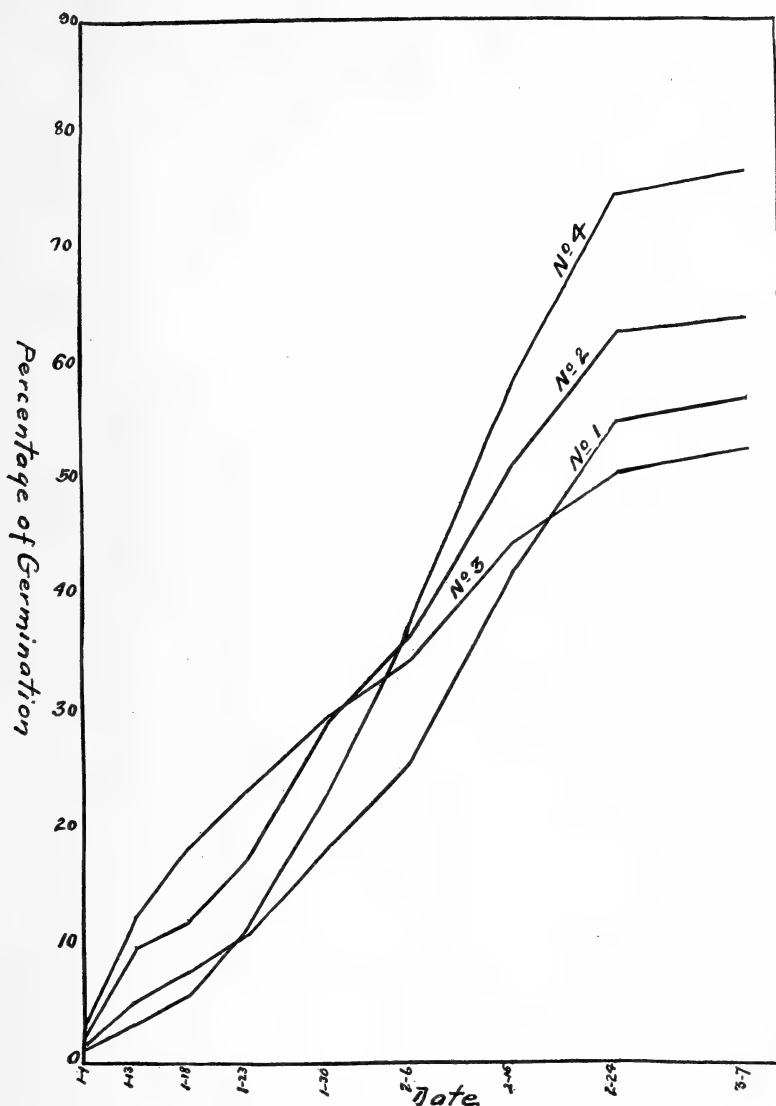


FIG. 5. Average germination of seed from the four plants in all three lots.

It is evident from the above tabulation that the seed from Lot A was the heaviest and that from Lot C was the lightest. It is believed that this condition is due to the fact that when the dried berries are picked it is impossible to distinguish at all times between

fully matured berries and those only partially matured, since all of them are dried and shrivelled. Consequently a slight percentage of immature and light seed is likely to be mixed with the good seed and this would naturally reduce the weight on the average.

COLOR OF THE SEED.

The different treatment of the seed has a distinct effect on the color. Lot *A* had by far the best appearance, the seed being of a uniform silver gray color with a fine luster. The treatment used with Lot *B* resulted in a nut-brown color with no luster whatever. This seed had a very poor appearance. Seed from Lot *C* had the appearance of the usual commercial seed, and consisted of both brown and gray seed having only little luster.

GERMINATION TESTS.

To test the germination of seed a total of 1,200 from each lot, *i. e.*, 300 from each of the four individual plants, were planted in flats on December 8, 1916. The first germination was noted on January 3, 1917, and on January 9 the first count was made. Thereafter the seedlings were counted at convenient intervals and after each count removed from the flat. In Table II are given the number of germinated seed at each period.

TABLE II.

Table Showing the Number of Seed Germinated in the Intervals between the Days on which the Counts were Made.

Lot.	Number of individual plant.	Number of seeds germinated during intervals between following dates.								
		Jan. 9.*	Jan. 13.	Jan. 18.	Jan. 23.	Jan. 30.	Feb. 6.	Feb. 15.	Feb. 24.	Mar. 7.
<i>A</i>	1	2	5	3	6	23	24	84	54	12
	2	9	23	25	28	61	44	43	15	4
	3	6	10	11	17	30	12	45	22	9
	4	11	15	15	19	37	53	56	31	3
<i>B</i>	1	0	3	6	10	27	22	38	14	5
	2	1	2	2	6	16	21	64	44	8
	3	23	68	45	27	18	11	12	1	0
	4	0	0	3	16	35	53	78	38	5
<i>C</i>	1	14	24	14	11	22	18	23	45	5
	2	12	24	11	14	28	9	20	38	5
	3	0	3	1	1	10	19	25	39	11
	4	2	4	3	13	38	25	58	76	6

* Seed planted December 8, 1916. First count made thirty-two days after planting.

One of the interesting points brought out by this table is the germination of the seed from the seed from plant No. 3. This seed in Lot *B* showed the greatest germination of any up to January 23. Seed from the same plant in Lot *C* showed the least germination during that period. During the remainder of the time the germination of this seed decreased rapidly in Lot *B* and increased in Lot *C*. No explanation for this peculiar behavior of the seed has become apparent.

In Table III the total germination at the end of each period is given.

TABLE III.

Table Showing the Total Number of Seed Germinated at the End of Each Period of Observation.

Lot.	No. of individual plant.	Total number of seed germinated at the end of each period.								
		Jan. 9.	Jan. 13.	Jan. 18.	Jan. 23.	Jan. 30.	Feb. 6.	Feb. 15.	Feb. 24.	Mar. 7.
<i>A</i>	1	2	7	10	16	39	63	147	201	213
	2	9	32	57	85	147	191	234	249	253
	3	6	16	27	44	74	86	131	153	162
	4	11	26	41	60	97	150	206	237	240
<i>B</i>	1	0	3	9	19	46	68	106	120	125
	2	1	3	5	11	27	48	112	156	164
	3	23	91	136	163	181	192	204	205	205
	4	0	0	3	19	54	107	185	223	228
<i>C</i>	1	14	38	52	63	85	103	126	171	176
	2	12	36	47	61	89	98	118	156	161
	3	0	3	4	5	15	34	59	98	109
	4	2	6	9	22	55	80	138	214	220

While the preceding table shows the actual number of seed germinated, Table IV following shows the total percentages germinated.

The data in Table IV is presented graphically in Figs. 1 to 4. A study of these charts leads to the conclusion that the seed from Lot *A* showed the best germination, both from the standpoint of total percentage of germination obtained and acceleration of the germination. Thus, on January 30 the average percentage germinated in Lot *A* was 29.8 per cent., in Lot *B* 25.6 per cent., and in Lot *C* 20.3 per cent., and after this date Lot *A* continued to show the greatest total germination. Seed from Lot *C* seemed to be inferior to either of the other lots but especially inferior to that from Lot *A*.

It is a significant fact that in point of vitality the seeds from the various lots rank the same as they do regarding color and weight.

TABLE IV.

Table Showing the Total Percentage of Seed Germinated at Each Period of Observation.

Lot.	Number of individual plant.	Total percentage of seed germinated at the end of each period.								
		Jan. 9.	Jan. 13.	Jan. 18.	Jan. 23.	Jan. 30.	Feb. 6.	Feb. 15.	Feb. 24.	Mar. 7.
A	1	0.6	2.3	3.3	5.3	13.0	21	49	67	71
	2	3	16.6	19	28.3	49	63.7	78	83	84.3
	3	2	5.3	9	14.6	24.6	28.6	47	51	54
	4	3.6	8.6	13.6	20	32.5	50	68.6	79	80
	Average..	2.3	8.2	11.3	12.5	29.8	40.8	60.6	70	72.3
B	1	0	1	3	6.3	15.3	22.6	35.5	40	41.6
	2	0.3	1	1.6	3.6	9	12	37.3	52	54.6
	3	7.6	30.3	45.3	54.5	60.3	64	68	68.1	68.3
	4	0	0	1	6.3	18	35.6	61.6	74.3	76
	Average..	2	8.1	12.7	17.7	25.6	33.5	50.6	58.6	60.1
C	1	4.6	12.6	17.3	21	28.3	34.3	42	57	58.6
	2	4	12	15.6	20.3	29.6	32.6	39.3	52	53.6
	3	0	1	1.3	1.6	5	11.3	19.6	32.6	36.3
	4	0.6	2	3	7.3	18.3	26.6	46	71.3	73.3
	Average..	2.3	6.9	9.3	12.5	20.3	26.2	36.7	53.1	55.4

We have here then a plain indication that the best seed from a physical standpoint is the most desirable for planting. From this it would appear that the method of gathering the seed followed in Lot A is the logical one to use. Another conclusion to be drawn from the data is that the molding and decomposing of the berries, while it detracts from the appearance of the seed does not very greatly affect its vitality. As a matter of practice, however, screening, washing, and drying the seed immediately after picking the berries is more convenient than to allow the latter to stand around in trays. Attention is again called to the probability of picking immature seed if the berries are allowed to dry on the plant. The probable presence of such seed in Lot C is indicated by the data on germination.

VARIATION IN THE GERMINATION OF SEED FROM INDIVIDUAL PLANTS.

The foregoing data furnish some information regarding the variation in the germination of seed from individual plants. To show this more plainly a table of average is submitted.

A study of this table and Chart 5, which shows the data arranged graphically, will reveal the fact that seed from plant No. 4 showed a 50 per cent. greater germination than seed from plant No. 3. Since

TABLE V.

Table Showing the Average Total Germination at the End of Each Period of the Seed from Each Individual Plant in all Three Lots.

Number of individual plant.	Percentage of total germination at the end of each period.								
	Jan. 9.	Jan. 13.	Jan. 18.	Jan. 23.	Jan. 30.	Feb. 6.	Feb. 15.	Feb. 24.	Mar. 7.
1	1.7	5.3	7.9	10.9	18.9	25.9	42.1	54.6	57.1
2	2.43	9.9	12.1	17.4	29.2	36.1	51.5	62.5	64.1
3	3.2	12.2	18.5	23.5	30	34.6	44.8	50.6	52.8
4	11.4	3.5	5.9	11.2	22.9	37.4	58.7	74.8	76.4

all the seed was handled under like conditions it would appear that the vitality of belladonna seed is influenced not only by such factors as time of picking and method of drying but is dependent to a certain extent on the characteristic of the individual plant which bears it.

CONCLUSIONS.

The following three methods of gathering belladonna seed were used: (A) The berries were picked when ripe and succulent, the seed was at once removed from the pulp by washing it through a sieve, after which it was dried; (B) the berries were picked at the same stage as in (A) but allowed to dry spontaneously, which resulted in much molding and partial decomposition; (C) the berries were allowed to remain on the plant until they were dry.

As regards weight of seed method A produced the heaviest, and method C the lightest seed. The latter method is likely to result in the admixture of some immature seed, owing to the difficulty of distinguishing between ripe and unripe berries when both are dry.

Method A also produced seed of the best uniform color, while method B resulted in seed of very poor color. Seed obtained by method A showed the highest percentage of germination, while seed from method C was the poorest in this respect.

Seed from different individual plants varies considerably in vitality.

ANALYSIS OF RHINITIS TABLETS.

BY REGINALD MILLER.

Camphor.—Weigh 100 tablets, powder eleven and take a weight of the powder corresponding to 10 tablets, add an equal volume of clean sand, extract with ethyl ether¹ (using a small beaker to hold the mixture of powder and sand) and decant through a small filter paper. Collect the filtrate in a weighed glass dish and evaporate to about 5 mils at a temperature around 60° C., allowing an electric fan to blow a current of air over the dish to hasten evaporation and to maintain a low temperature. The remaining 5 mils are evaporated spontaneously.

Weigh the dish and residue immediately upon drying² and call this weight *A*. The dish with residue after weighing is heated at 100° C. until the odor of camphor is no longer perceptible, cool, weigh, subtract this weight from weight (*A*). The difference represents the camphor in ten tablets. (A correction may be necessary, due to volatilization of camphor.)²

Quinine Sulphate.—The powder remaining in the beaker is extracted with a mixture of chloroform and absolute alcohol,³ decant through the filter paper used in the camphor determination, collect filtrate in a weighed glass dish, evaporate the solvent and dry at 110° C. until a constant weight is obtained.⁴ From this weight com-

¹ Use portions of ether of about 10 mils each and make about 5 or 6 extractions, always allowing the powder to settle before decantation.

² The camphor is quite volatile, hence the immediate weighing. The loss should be determined by treating a weighed portion of camphor under the same conditions on the steam bath alongside of the sample, and then making corrections accordingly.

³ The mixture consists of two volumes of chloroform and one volume of absolute alcohol. About 5 or 6 extractions of 10 mils each will suffice.

⁴ The U. S. P. (9th edition) allows for a loss of 16.2 per cent. in weight, whereas the actual amount of water present is 14.45 per cent. It therefore is necessary to compute the quinine sulphate on both bases, and accept the figure which is nearer the amount supposed to be present. Calculate as follows:

(100 — 16.2) : 100 :: wt. of residue : $x - x$ = U. S. P. quinine sulphate allowing a loss of 16.2 per cent.

(100 — 14.5) : 100 :: wt. of residue : $x - x$ = U. S. P. quinine sulphate allowing a loss of 14.45 per cent.

pute the quantity of U. S. P. quinine sulphate, after making tests upon the residue to prove that it is quinine sulphate.

*Fluid Extract Belladonna.*⁵—Powder 50 weighed tablets, add 3 mls of $\frac{N}{10}$ sulphuric acid⁶ and 12 mls of distilled water, warm for about one hour at about 40° C., filter, make filtrate neutral to litmus paper by addition of $\frac{N}{10}$ sodium hydroxide.

To .9 of a mil of the neutralized filtrate add .1 of a mil of salt solution.⁷

Introduce two drops of this solution into a cat's eye⁸ every five minutes until a total of six drops have been introduced.

The pupil of the cat's eye should show a dilation after an elapse of one hour if the sample contains fluid extract of belladonna.⁹ If, however, there is no dilation of the pupil noticeable after an elapse of one hour, it is advisable to try another cat, and introduce a total of eight drops over a period of twenty minutes. The cat's eye should be observed every half hour until an elapse of about five hours.

CHEMICAL LABORATORY,
DEPARTMENT OF HEALTH,
NEW YORK CITY.

ANALYSIS OF TABLETS CONTAINING SALOL AND QUININE SULPHATE.

BY REGINALD MILLER.

Salol.—Weigh twenty-five tablets and powder them, take of the well-mixed powder a portion corresponding to the average weight of one tablet. Transfer to a small beaker, add an equal volume of clean sand.¹

⁵ This is detected by qualitative test.

⁶ There must be a slight excess of acid present; test with litmus paper and if not acid, add more until it is.

⁷ The salt solution is made by dissolving one G. of sodium chloride in 100 mls of distilled water.

⁸ After each introduction of the solution in the cat's eye, the membrane surrounding the eye should be gently closed and opened in order to aid the absorption. Care must also be taken that none of the fluid gets into the cat's mouth or nose.

⁹ The dilation begins in about forty-five minutes and is very pronounced after an elapse of one hour.

¹ Sand seems to facilitate the extraction.

Add petroleum ether² to the mixture in the beaker, using 10 mil portions (making about five or six extractions), decant through a dry filter paper, collecting the filtrate in a weighed glass dish.

Evaporate the solvent on a water bath, allowing a current of air from an electric fan to assist the evaporation. When the solvent is nearly volatilized remove the dish from the water bath and allow the remainder of the solvent to evaporate spontaneously, using the current of air from the fan. Weigh residue immediately upon the absence of petroleum ether odor.³ If the determination is made as above directed the loss due to the volatilization of the salol is negligible.

The residue, if salol, will give the following tests:

The distinctive odor of salol.

Melting point 41 to 43° C.

Conc. nitric acid—colorless.

Froede's reagent—deep purple, gradually to an olive green.

Formaldehyde sulphuric acid—pink to a very deep pinkish red.

Selenous sulphuric acid—colorless to a faint yellow.

Ferric chloride—no change in color.

Salol is saponified by sodium hydroxide, and if an excess of hydrochloric acid is then added, salicylic acid will be precipitated (if sufficient salol is taken) and phenol liberated which can be recognized by its distinctive odor. Both of these liberated products can be removed by ethyl ether, and tested with ferric chloride, which gives a violet coloration.

*Quinine Sulphate.*⁴—The residue in the beaker is repeatedly extracted with 10 mil portions of a mixture of chloroform and absolute alcohol,⁵ making about six to eight extractions. Decant through the filter paper used in the determination of salol, and collect filtrate in a weighed glass dish, evaporate to dryness and heat at 110° C. until a constant weight is obtained.

² Merck's benzin (petroleum ether) reagent is used. The quinine sulphate is practically insoluble in benzin.

³ If the dish containing the salol is allowed to remain on the steam bath for one half hour, a correction of about 5 per cent. must be made, due to loss of salol by volatilization. This factor, however, must be determined by running a known sample of salol in parallel with the unknown under the same conditions. It is advisable to determine the salol roughly at first, and then use this figure as an index of the amount of authentic salol required for the control determination.

This weight represents anhydrous quinine sulphate, and from it U. S. P. quinine sulphate is calculated.⁶

The residue⁷ should respond to the following tests: A portion dissolved in water by the aid of sulphuric acid (about 1 per cent.) gives a vivid blue fluorescence which disappears upon the addition of hydrochloric acid.

Barium chloride⁸ added to an aqueous solution of quinine sulphate containing concentrated hydrochloric acid gives a white precipitate.

Dissolve some of the quinine in very dilute acetic acid, add a few drops of bromine water, and an excess of ammonium hydroxide, a green color results.

To an aqueous solution add one drop of hydrogen peroxide and one drop of copper sulphate, heat, a red coloration is obtained.

CHEMICAL LABORATORY,
 DEPARTMENT OF HEALTH,
 NEW YORK CITY.

⁴The quinine may be extracted as the alkaloid and then computed to quinine sulphate. It may be determined, by transferring the residue in the beaker and filter paper (used in salol determination) to a separatory funnel, using dilute sulphuric acid (about 1 per cent.), then adding a slight excess of ammonium hydroxide, and extracting repeatedly with ethyl ether, collecting the ether in a weighed dish (pour ether through a dry filter paper), evaporate, and dry to constant weight at 100° C. and compute to U. S. P. quinine sulphate.

⁵Two volumes of chloroform and one volume of absolute alcohol.

⁶When calculating U. S. P. quinine sulphate, two proportions can be made: (*A*) in accordance with maximum loss permitted by U. S. P. on heating to 110° C., namely, 16.2 per cent. by weight; (*B*) the actual water content in U. S. P. quinine sulphate, namely, 14.45 per cent. by weight.

A. (Weight of anhydrous quinine sulphate dried at 110° C.)

$$: (100 - 16.2) :: x : 100;$$

$x =$ U. S. P. quinine sulphate.

B. (Weight of anhydrous quinine sulphate dried at 110° C.)

$$: (100 - 14.45) :: x : 100;$$

$x =$ U. S. P. quinine sulphate.

⁷For the qualitative tests about ten or more tablets can be treated as in the outline if necessary, but the residue need not be weighed.

⁸If the analysis is a very important one, the sulphate radicle may be determined quantitatively, and quinine sulphate calculated therefrom.

THE CULTIVATION OF CASTOR OIL PLANT AS A COMMERCIAL POSSIBILITY. *RICINUS CUMMUNIS*,
PALMA CHRISTI.¹

BY JOSEPH L. LEMBERGER, PH.M.

Always an admirer of the beautiful Palma Christi—a thought possessed the writer to plant some of the seed of the variety known as *Ricinus sanguineus*—a beautiful, stately and highly colored plant, and note results as to its commercial value. My experience was satisfactory beyond expectation, having no previous thought beyond that of an ornamental bush, and when the fact has materialized, that if the castor bean can be cultivated as a commercial product a large agricultural asset will be attained.

After the season had closed correspondence with seed crushers and vegetable oil producers has convinced me that the subject is entirely feasible and deserves more than passing attention—weather conditions appearing as the only doubtful factor. This also applies to other crops as well.

The cultivation is very simple. The seed will germinate almost anywhere provided the soil is good. Experiment is being made this summer planting the seed along the fences where the plow and harrow cannot be used and only when the commercial fact is proven or established, need we think of field culture.

I am interesting farmers in my county and experiment will be made on a much larger scale—will try some waste places on the farm, and, if successful, may publish the results, if spared, some future time.

It will be interesting to know that there is not at this time any attention paid to cultivation of castor oil beans for commercial purposes in this country. After the writer began formulating this paper, searching for data, etc., reference to Professor William Procter's article along similar lines in 1855, giving a particular account of the mode of cultivation in Western States (*AMERICAN JOURNAL OF PHARMACY*, Vol. 28, p. 99). At that period we remember the St. Louis brand castor oil stenciled on the boxed containers and barrels of castor oil. The present generation of pressers of the castor oil seed know nothing of the industry of that period and it is evident

¹ *Proc. Penn. Ph. Assoc.*, 1916, p. 209.

that there is no longer any attention given to the cultivation of castor oil bean as an industry. The JOURNAL quoted from has the following which I prefer to make part of this paper as a pleasant memory of our departed friend:

"Southern Illinois is the source from whence all the beans are brought that are sold or manufactured in St. Louis. The ground is prepared as for other crops, and when there is no longer any danger from the spring frosts, the seeds are planted in hills and rows, much in the manner of planting Indian corn, with the exception that there is but one seed put into each hill, and that at every fourth row a space is left sufficiently wide to admit of the passage of a team for the purpose of gathering the crop. Unlike the cereal grains the ricinus bears at the same time flowers and fruit, and the severity of our climate, which renders it in this latitude an annual plant, destroys its vitality whilst yet decked with bloom. The ripening commences in August, and the crop is gathered at intervals from this date till the plants are destroyed by the frost.

"The yield, of course, varies with the quality of the soil, and the care of the culture. Twenty-five bushels from an acre of ground is considered a very large crop, and is but seldom obtained. From sixteen to twenty bushels per acre is a very fair yield in a season not marked by drought or other unfavorable feature.

Year.	Crop in bushels.	Factories in Illinois.	Factories in St. Louis.	Barrels of oil made.	Equivalent in gallons.
1850	250,000	18	2	9,900	350,000
1851	160,000	7	2	7,000	255,000
1852	90,000	5	2	5,500	192,500
1853	65,000	3	3	4,200	147,000

"The estimated crop of beans for 1854 is but 10,000 bushels, being almost a total failure, arising from the excessive drought that prevailed during the past summer over that part of the country. The number of mills in operation in 1854 was but five, and they only employed part of the time."

As indicated, I planted the bean of *Ricinus sanguineus*—I knew no other variety at that time. There are other varieties, and I have obtained and planted this year *Ricinus Gibsonii*, *Ricinus macrocarpus* and *Ricinus philippinensis*. The mature plant in my yard attained the height of about fifteen feet. The foot stalk of one of the plants, as well as some specimens of the fruit, are herewith exhibited.

Through correspondence with one of the largest seed crushers and oil producing firms in this country, much valuable information was obtained, and the following excerpts from several letters will, I feel sure, interest you:

March 23, 1916.

"We have the pleasure to acknowledge receipt of your valued favor of March 22 and are very pleased that you are interested in raising castor beans as a commercial crop.

"If you can raise these in sufficient quantities, or if by combining with your neighbors you are able to do so, we think the experiment might be profitable.

"The value of castor seed, or castor beans, fluctuates very much, according to the size of the crop in India, the demand for consumption in the United States, and the fluctuation in freights from India to the United States; which, in the latter case, have risen from about 20 cents per bushel of 50 pounds to \$1.40 per bushel of 50 pounds, due to war conditions and the requisitioning of so many ships by the English government.

"At the present time the value of castor beans, in not less than carload lots, delivered to New York City points, in bags and without charge for bags, is from \$2.25 to \$3.15 per bushel. It has been higher and it has been within the last two years as low as \$1.22 per bushel. However, we think the normal price is about \$1.30 per bushel, 50 pounds being considered a bushel.

"We can give you no information whatever regarding planting of these seeds, as derived from those who have planted them for commercial crops; and inquiry at the Department of Agriculture at Washington fails to elicit any information in this direction. The superintendent of a large country place near Buffalo has advised us that he would expect success in planting one bean to a hill and placing the hills three feet apart in rows four feet apart. We think, however, he had in mind the raising of beans for the beauty of the plant and blossom rather than for commercial purposes; and that in planting for a commercial crop it would be better to plant three beans in a hill, lest one bean might possibly not germinate. On the above basis, it would require 726 beans to plant one acre, one bean to a hill, or, say, 1½ quarts or about 2¼ pounds; and to plant three beans in a hill, 2,178 beans, or, say 4½ quarts to about 6¾ pounds.

"We would be interested to know how this compares with your experience and to see a sample of the beans raised by you."

March 27, 1916.

"We beg to thank you for your letter of March 24, which contained very interesting information regarding the cultivation of castor seed with some of which we were not familiar.

"We also thank you very much for the sample of the seeds you have raised and have sent them to our laboratory for analysis as to percentage of oil contained therein. On receipt of our chemist's report which, however, may not be for two or three weeks, as the laboratory is very busy just now with very important matters, we shall be very glad indeed to give you our opinion of the value of the seed as compared with that shipped from Bombay, India."

April 1, 1916.

"Referring to the sample of castor beans you were kind enough to send us, we beg to report that an analysis indicates them to contain about the same percentage of oil as the Bombay beans."

The foot stalk or trunk of the plant you will observe is full of pithy cellulose—membranous substance, very suggestive for wood paper pulp—trying to determine uses for the woody portions of the plant, the writer incinerated—the burr envelope of the seed and all other portions of plant, and by the old process of making lye by lixiviation and evaporation, obtained a fair percentage of potash, and have for your inspection a presentable sample of nitrate of potassium. The experience we are passing through at this time naturally leads one to believe that we might economize, incinerating much of the refuse of saw mills—and forestry—with a view to utilizing the alkali.

In concluding this examination as to the possibilities, would define:

1. Enlarged castor oil industry in the United States.
2. As a by-product, paper pulp or the conservation of alkali contents from burr to root.

As a last word, all portilons of this country may not be available on account of climatic conditions, but the writer believes from his experience that the moist, warm regions of the southern part of this country should take advantage of the possibility. We may not be able to raise the African *Ricinus* as a perennial tree, as is stated by a writer, but realize the practical possibility of having annual crops of castor oil beans as is done with any of the familiar farm products.

THE PRICE OF GASOLINE.

The final report of the Federal Trade Commission on the price of gasoline in 1915 has recently been published. This investigation had to do with all phases of the petroleum industry. Practically the entire supply of gasoline is made from crude oil or petroleum. The total production of this article in the United States in 1915 was about 306,000,000 barrels. The chief element in the demand for gasoline is the internal-combustion engine. The summary of facts and conclusions is as follows:

The demand for gasoline as measured by consumption has in-

creased, and was about 38 per cent. greater in 1915 than in 1914. The supply did not increase in proportion, the quantity of gasoline and naphtha manufactured in 1915 being 31 per cent. greater than in 1914. The difference between production and sales was covered by decreases in stocks of gasoline. As a result the general level of prices in 1915 was necessarily and naturally somewhat higher than in 1914.

This conclusion, however, does not indicate how much higher the price of gasoline should have been on the basis of strictly competitive conditions, nor does it indicate when and where the advances required by such conditions should have taken place.

Cost figures for representative refiners indicate that the margins in December, 1915, were from about 1 to 3 cents per gallon greater than in July. (See original report.) That is to say, while costs increased, prices increased much more, with the result that in general the refiners were making much larger net returns per gallon of gasoline in December than in July or in August. This fact is reflected in the larger net earnings in 1915 of the principal refining companies and the increased stock-exchange quotations on the securities of such companies toward the end of that year.

While prices advanced rapidly in all parts of the country between September and December, 1915, the movement of prices to September was irregular, in some cases declining, in others rising, and in still others remaining nearly stationary. The rise between September and December was general, but was more rapid in some localities than in others. In relation to cost, the prices were much lower in some sections of the country than in others, as shown in the difference in margins per gallon of gasoline made by refiners in different localities.

These differences have this in common: They all correspond to certain areas described in this report as Standard marketing territories. Within such territories the price of gasoline moved with practical uniformity. Between them there were wide differences.

These marketing territories were established long ago and with little reference to the gasoline business. They bear little relation to the areas that would be adapted to the most economical marketing of gasoline (see report), a fact conclusively proved by the large interterritory sales among Standard companies and the conduct of profitable business by "independent" companies within the area embraced in these territories but with very different boundaries.

This correspondence of the differences in prices with Standard marketing territories in itself points to arbitrary price making. But the arbitrary character of the inequalities in price is conclusively demonstrated by the facts (1) that as between most of the territories there were no such differences in demand or supply as would explain the frequent and unequal variations in prices, and (2) that the margin between cost and price was widely different in the different territories.

These territories, if they should continue to exist, would have a significance different from that they now possess if they were occupied by companies which were separately owned. As a matter of fact, the several Standard companies are interrelated through a common body of majority stockholders.

Throughout this report it has been apparent that the maintenance of different markets for gasoline by companies among which there exists a substantial community of ownership has been of fundamental importance in the gasoline situation. This condition should be modified.

In the Federal Trade Commission's Report on Pipe-Line Transportation of Petroleum, and in the preceding chapter of this report, it has been shown that control of pipe lines has been a decisive factor in giving certain large refining interests advantages over their competitors. The combination of pipe lines with the other branches of the industry in single business organizations has tended to establish and perpetuate monopoly. To be sure, three of four large competitors exist; but the history of their operations appears to indicate that, after a preliminary competitive onslaught in which a fairly satisfactory amount of business is gained, they "dig themselves in," to use a military metaphor, and thereafter "follow the Standard market." It is noteworthy that those districts in which The Texas Company and the Gulf Refining Company were engaged in business along with the Standard companies were by no means always the places where prices of gasoline were low in 1915.

If competition is to be effective in the business of refining petroleum and marketing petroleum products, the pipe lines which are necessary for transporting the raw material, crude oil, must be made available to all refiners on equal and reasonable terms both as to rates and service. It has been decided by the courts that pipe lines are common carriers and as such are subject to the control of the Interstate Commerce Commission. It may be that in time their rates

of charge and conditions of service will be so regulated as to be just and equal to all producers and refiners. Such regulation, however, has not yet been tested, and, in view of the differences between pipe-line transportation and railway transportation, its effectiveness is problematical. The analogy of the coal carriers and of the "commodities clause" suggests that it would be desirable to effect a complete separation of the ownership of the pipe lines from the ownership of the oil which they transport, and that a law to that effect is feasible. It is generally recognized that when the carrier is identified with certain shippers it is very difficult to prevent rates and conditions which are equivalent to discrimination, and the Interstate Commerce Commission has repeatedly called attention to this difficulty.

A powerful agency for insuring a just balance of supply and demand—for eliminating violent fluctuations in price—is knowledge of conditions. This truth is well illustrated by advantages gained from the statistics of crops compiled by the Department of Agriculture and even from the statistics of live-stock receipts from private sources. Such statistics concerning the petroleum industry as are now available are not satisfactory. Information on vital points does not appear on time and the data are regarded with suspicion by many "independent" oil men.

Several statements on this subject were made to the Commission at one of its hearings, excerpts from which follow. A jobber said:

I suppose it cost me \$50,000 last year (1915) for lack of knowledge. If we had had any way to know the crude conditions, we could have protected ourselves in the market. . . . If there had been knowledge at our hand of the falling off of the production at Cushing, we would not have been caught with such a small amount of supplies. The other people who have greater knowledge of the situation could reduce their price on the 10th of June and make us think that the production was increasing and there was going to be still cheaper gasoline. . . . Now, if we had statistics in the oil business that gave bona fide statements, we could then know what the runs were every day, and we could tell what the stocks on hand were every day, all of which would tend to create a more solid condition in the oil business.

Another jobber said:

It seems to me that the statistics available in the oil business are very meager indeed. . . . But if it were possible to get government statistics, brought fairly well up to date, as to the production of gasoline, if you please, and the shipments of gasoline, and the volume going into the different territories, and the stocks of distillates of benzine on hand, it seems to me that would be of very measurable help.

The citations are of interest, not only as showing the need, but as indicating the character of information needed.

As to the means of securing the information, it is clear that it should devolve upon some branch of the federal government to collect and publish pertinent statistics.

As indicated in this report, the quality of gasoline is difficult of measurement and has probably deteriorated during recent years. Various products, all called gasoline, are sold under a common name, and the result is confusion in which inferior qualities may be sold at the price of superior ones. There has been a trend toward putting on the market blended products which often contain such quantities of nonvolatile (high boiling point) products as to give very unsatisfactory results in the more important classes of gasoline engines.

The recommendations and suggestions of the Commission concerning the foregoing matters are as follows:

(1) AS TO COMMON OWNERSHIP.

I. With respect to the application of the present antitrust laws, the Commission makes the following findings, and has taken action thereon as prescribed by law.

The Commission finds:

1. That the several Standard companies have maintained a distribution of territory in the marketing of gasoline, and that no substantial competition in the chief petroleum products exists among the several Standard companies.

2. That this absence of competition is due to a community of stock ownership, which community of interest is the result of the ratable distribution of stock under the dissolution as ordered by the court.

3. That the facts disclose such advances in prices of gasoline and such differences in price corresponding to Standard marketing territories as are not possible of explanation apart from the foregoing conditions.

4. The Commission has found no direct evidence of collusion among the several Standard companies in violation of the dissolution decree.

Section 6 (c) of the Federal Trade Commission act provides that the commission shall have power—

Whenever a final decree has been entered against any defendant corporation in any suit brought by the United States to prevent and restrain any vio-

lation of the anti-trust acts, to make investigation, upon its own initiative, of the manner in which the decree has been or is being carried out, and upon the application of the Attorney General it shall be its duty to make such investigation. It shall transmit to the Attorney General a report embodying its findings and recommendations as a result of any such investigation, and the report shall be made public in the discretion of the commission.

The Commission's findings, together with the evidence, have, therefore, been submitted to the Department of Justice for its consideration and for such action, if any, as it may deem advisable under existing law.¹

II. With a view to preventing or remedying such conditions as obtain in the oil industry, the Commission suggests various plans for legislation, as follows:

1. A law providing for the reopening of antitrust cases on the application of the Attorney General by a bill of review for the purpose of securing such modifications of decrees as new conditions may require.

¹ Section 6 of the dissolution decree (*U. S. v. Standard Oil Co.*, 173 Fed., 199-200) provides as follows:

"*Sec. 6.* That the defendants named in section 2 of this decree, their officers, directors, agents, servants, and employees, are enjoined and prohibited from continuing or carrying into further effect the combination adjudged illegal hereby, and from entering into or performing any like combination or conspiracy, the effect of which is, or will be, to restrain commerce in petroleum or its products among the States, or in the Territories, or with foreign nations, or to prolong the unlawful monopoly of such commerce obtained and possessed by defendants as before stated, in violation of the act of July 2, 1890, either (1) by the use of liquidating certificates, or other written evidences of a stock interest in two or more potentially competitive parties to the illegal combination, by causing the conveyance of the physical property and business of any of said parties to a potentially competitive party to this combination, by causing the conveyance of the property and business of two or more of the potentially competitive parties to this combination to any party thereto, by placing the control of any of said corporations in a trustee, or group of trustees, by causing its stock or property to be held by others than its equitable owners, or by any similar device, or (2) by making any express or implied agreement or arrangement together, or one with another, like that adjudged illegal hereby relative to the control or management of any of said corporations, or the price or terms of purchase, or of sale, or the rates of transportation, of petroleum or its products in interstate or international commerce, or relative to the quantities thereof purchased, sold, transported, or manufactured by any of said corporations, which will have a like effect in restraint of commerce among the States, in the Territories, and with foreign nations to that of the combinations the operation of which is hereby enjoined."

2. Abolition, by legislation, in certain cases, of common stock ownership in corporations which have been members of a combination dissolved under the Sherman Law.

3. Effective limitation upon common ownership of stock in potentially competitive corporations by withdrawing the power of voting and control.

4. Legislation which, while recognizing common ownership, would fix upon such common owners the responsibility for the acts of each of the several companies so owned, which prevent competition.

As to 1.—It is suggested that there be added to paragraph (c) of Section 6 of the Trade Commission Act a proviso to cover all cases in antitrust suits where there apparently has been a technical compliance with the decree but in which for any reason the decree has not been effective. Such law should provide generally that in any case where the findings of the Trade Commission reveal no such violation of the decree as would constitute a ground for contempt proceedings, but which show that the decree has failed to bring about competitive conditions, the Attorney General shall have power and it shall be his duty to embody such findings and recommendations in a bill of review to be filed in the court entering the decree; and such law should further provide that upon the filing of such bill of review the court shall reopen the suit and take further testimony touching the efficacy of the decree in bringing about competitive conditions. The findings of the Trade Commission should be made admissible as evidence. Such law should further provide that on proof the court shall have power to amplify and modify the decree in such manner as may be necessary fully to restore competitive conditions.

As to 2.—It is suggested that the evils growing out of common ownership may be successfully prevented by legislation declaring it to be unlawful for any person to own, directly or indirectly, shares of stock in more than one of the companies into which a combination in the form of holding company or consolidated corporation (except railroad combinations) has been dissolved under the Sherman law, whenever such companies are engaged in the same line of commerce. In other words, to enact into law the doctrine as to diverse ownership of competing corporations which has been laid down by the courts in the Union Pacific, Reading, and other recent cases.

As to 3.—It is suggested that instead of forbidding absolutely common ownership, the same effect may probably be reached by

withdrawing entirely from such owners the right to vote or hold office or otherwise exercise power of control, whether the same is done directly or indirectly. Such withdrawal of rights might even be extended to the right to receive benefits and earnings. It might be made applicable to all potentially competitive corporations.

As to 4.—If it is deemed inadvisable by Congress to prevent common ownership, with its almost inevitable restriction of competition, it is suggested that legislation might be enacted fixing upon the common owners of stock in potentially competing concerns the responsibility for the acts of such corporations, so owned, which result in the prevention of competition or the abolition of competitive conditions.

As to pipe lines, it is the opinion of this Commission that it would in the long run be the simplest and most effective policy to segregate the ownership of the pipe lines from the other branches of the petroleum industry. This would mean that no controlling portion of the stock of any pipe-line company engaged in interstate commerce should be owned by any individual, company, or corporation, or by any group of individuals, companies, or corporations, that are also interested as owners in any oil producing or refining properties; and vice versa.

In view of the bearing of accurate information upon industry and competitive conditions, it is suggested that an appropriate branch of the federal government should be provided with adequate means for carrying on the statistical work required. It is of the utmost importance that the work be performed with integrity, accuracy, and dispatch. It is believed that (independently of any remedies that may be adopted to secure a more competitive organization of industry) to make available currently the statistical information here contemplated would go far toward preventing such abnormal and unequal price advances as occurred in the gasoline markets of the United States in 1915.

With regard to quality of product, the Commission suggests the desirability of classifying gasoline products. It is a simple matter to ascertain what proportion of a sample of gasoline is sufficiently volatile to insure the reasonably easy starting and flexibility of operation of the ordinary internal combustion engine. If a law were enacted which would provide that only such petroleum products as contain the desired proportion of sufficiently volatile elements shall be sold in interstate commerce as gasoline, it is believed that it would lead to a desirable measure of classification and uniformity in quality.

PHILADELPHIA COLLEGE OF PHARMACY.

MINUTES OF THE ANNUAL MEETING.

The annual meeting of the Philadelphia College of Pharmacy was held March 26, 1917, at 4 P.M. in the library, the president, Howard B. French, presiding. Twenty-one members were present. The minutes of the quarterly meeting of the College, held December 26, 1916, were read and approved. The minutes of the board of trustees for December 5, 1916, January 2, 1917, and February 6, 1917, were read by the registrar, J. S. Beetem, and approved.

President French then delivered his annual address, giving an account of the transactions of the various departments, the condition of the buildings and an expression of some of the expectations of the future. The address was eagerly listened to and at its close continued applause was given. Later in the session Mr. George M. Beringer said that owing to the modesty of the president no disposition of the address had been made. He therefore moved that the address be referred to the publication committee and such abstracts as it was desirable to have published be published in the *AMERICAN JOURNAL OF PHARMACY*. Seconded and so ordered (see this *JOURNAL*, page 236).

The report of the committee on nominations, Joseph W. England, chairman, was read and ordered entered and filed.

A communication from Henry C. Blair was read, declining the nomination to the board of trustees, as he would be unable to serve.

The committee appointed to draft resolutions in memory of our late fellow member, Martin I. Wilbert, reported as follows:

"1865.

Martin I. Wilbert.

1916.

"At the quarterly meeting of the Philadelphia College of Pharmacy held at the College December 26, 1916, a committee was appointed for the purpose of expressing the profound sorrow caused by the sudden death of Martin Inventius Wilbert. Dr. Wilbert died at the German Hospital in this city, where for years he was the chief pharmacist. At the time of his death he was engaged in carrying on important work for the government at the hygienic laboratory, United States Public Health Service, Washington, D. C.

"Dr. Wilbert was a graduate of the Philadelphia College of Pharmacy and one of its most prominent representatives. He possessed a character of unusual attractiveness. He was fearless, aggressive and indefatigable in his endeavors to raise the status of professional pharmacy, and yet he was always

considerate of the feelings of those with whom he differed. He was courteous and cordial in his bearing toward all. The members of the College desire to express their sense of personal loss through Dr. Wilbert's death. His life was well spent in advancing the cause of pharmacy and in promoting the public welfare. His death is a personal loss to all who knew him.

"H. K. MULFORD, *Chairman*,

"JOSEPH P. REMINGTON,

"F. E. STEWART, M.D."

when, on motion, the report was received and an engrossed copy directed to be forwarded to the family.

Dr. A. W. Miller, for the committee on the relief of Belgian pharmacists, reported that the funds in hand had been forwarded to the Netherlands Pharmaceutical Society, but up to this time no reply had been received.

Editor's Report by Henry Kraemer.—The AMERICAN JOURNAL OF PHARMACY has been issued regularly during the past year.

It is very gratifying to the editor to receive the support and co-operation of so many of the best writers and investigators in American pharmacy. Most authors are cognizant of the fact that the JOURNAL is widely read by their fellow workers and that the work published herein is utilized by writers of text-books and commentaries.

There have been published about sixty-five original articles by about fifty different authors. It has been a source of profound regret to be cut off from communications with his associates of other journals, whose people are engaged in war. We have been compelled to stop sending the JOURNAL in foreign exchange, but have reserved sufficient copies so that we can replenish the libraries of Europe and furnish the editors of foreign magazines with copies.

During the twenty years of the present editorship the grim reaper of death has claimed but three members of our publication committee. The last of these was Martin I. Wilbert. His article on the Pharmaceutical Exhibit held last fall at the College and published in the October issue was the last article from his pen, and it is very gratifying to us to know that during his lifetime and especially in connection with the late Exhibition he had evidences of our gratitude to him for his services, and of the work he had done for American pharmacy.

In addition to the large amount of original matter that has been published we have had several historical articles. One deserves special mention, "Pharmaceutical Exhibit at the Philadelphia Col-

lege of Pharmacy," by Dr. Robert P. Fischelis. This required a large amount of painstaking work, and is a model of its kind.

Report of the Librarian.—Miss Katharine E. Nagle reported that the total number of books accessioned to date is 9,079. Total number of books catalogued 6,230, and the cards filed alphabetically for consulting. The expenditures during the year have been \$388.22. Use of library by professors, students and the public totaled 3,190. In connection with the report of the librarian, Professor Kraemer said that most of us did not appreciate the wealth of material we possessed, yet there was a class of publications that we were deficient in, such as reports of the National Wholesale Drug Association, trade organizations and reports of various state associations. Much practical work was recorded in these publications and the help and coöperation of the members was asked to secure them. Mr. French stated that his firm had City Directories dating back to about 1860 and asked if they would be of service in the library. Several members expressed themselves as favoring their acceptance by the College.

Committee on Pharmaceutical Meetings.—The chairman said there have been no meetings held during the year, due in part to the fact that our members were very active in connection with the Special Exhibition which was held at the time of the meeting of the American Pharmaceutical Association, and also in part to the fact that it has been a very active year at the College. It is quite likely that this work will be actively resumed in the near future with profit to our members and an extension of the influence of our College.

Report of the Publication Committee.—In the absence of the chairman, Professor S. P. Sadtler, this report was read by Professor Remington.

The report for this year does not cover the entire year; owing to unavoidable delay the March issue did not get into the mails as early as usual, so that the financial report does not include the receipts for the entire year, although all bills for the year were paid. Nevertheless we have a very substantial foundation to begin business with this year and we are taking steps to increase both the advertising and subscriptions and the outlook is rather promising.

The usual appropriation from the College for the use of the JOURNAL was granted.

Report of the Curator.—Mr. Joseph W. England said: The arrangement of monographic collections of drugs and drug products

initiated last year by Professor Kraemer has been completed, and the cases in the Museum now contain a series of exceedingly interesting and valuable collections, showing the plants and plant parts of prominent drugs, together with colored photographs or sketches showing methods of gathering special features, etc.

Professor Remington reported the death of Professor C. Lewis Diehl at Louisville, Ky., on March 25, 1917. Professor Diehl was not a member of the College but was long identified with the profession of pharmacy and pharmaceutical literature.

Professor Kraemer called attention to the fact that to-day, March 26, the dean of the College, Professor Joseph P. Remington, celebrates a memorable natal anniversary, and moved that the members of the College then assembled felicitate him on the occasion and extend to him our best wishes for many more years of service in the Philadelphia College of Pharmacy and to the cause of American pharmacy. The motion was unanimously approved, when Professor Remington in a few words expressed his gratification.

The thanks of the College were voted Professor E. G. Eberle for the donation of a large photograph of the late M. I. Wilbert.

Election of Officers, Committees and Trustees.—Joseph W. England, Russell T. Blackwood and Charles F. Leibert were appointed tellers. While the tellers were counting the ballots the president announced the following appointments:

Committee on By-Laws: George M. Beringer, Joseph W. England, C. A. Weidemann.

Delegates to Pennsylvania Pharmaceutical Association: E. F. Cook, chairman, Charles H. La Wall, C. B. Lowe, F. X. Moerk, O. W. Osterlund, F. P. Stroup, J. W. Sturmer, John K. Thum.

Delegates to Delaware Pharmaceutical Association: Dr. A. W. Miller, chairman, C. B. Lowe, S. L. Foster, H. J. Watson.

Delegates to the New Jersey Pharmaceutical Association: C. B. Lowe, chairman, George M. Beringer, Henry Kraemer, Charles H. La Wall, J. W. Sturmer.

The tellers reported as the result of the ballot the election of the following: President, Howard B. French; First Vice-President, R. V. Mattison, M.D.; Second Vice-President, Joseph L. Lemberger; Treasurer, Warren H. Poley; Corresponding Secretary, A. W. Miller, M.D.; Recording Secretary, C. A. Weidemann, M.D.; Curator, Joseph W. England; Editor, Henry Kraemer; Librarian, Katharine E. Nagle.

Trustees: Joseph P. Remington, C. Stanley French and George B. Evans.

Publication Committee: Samuel P. Sadtler, Henry Kraemer, Joseph W. England, Joseph P. Remington, Charles H. La Wall, George M. Beringer and John K. Thum.

Committee of Pharmaceutical Meetings: Henry Kraemer, Joseph P. Remington, C. B. Lowe, M.D., George B. Weidemann and E. H. Hessler.

President French stated he had received a communication from the second- and third-year classes which he desired to submit for the consideration of the members. He then read the following communication:

MR. HOWARD B. FRENCH, *President*:

Realizing the critical condition in which the government of the United States is now placed by the threatened aggressions of a foreign nation, the senior classes of the Philadelphia College of Pharmacy, or a majority of the members thereof, desire to offer their services to the proper authorities of the government as pharmacists to serve in hospitals, army posts, or in the navy, or in other capacity in which we, as pharmacists, can render service, and as the necessities may require.

Therefore, be it Resolved, That we request the president of the Philadelphia College of Pharmacy to notify the proper officials of our government of our desire to serve the nation, the state and the city with the knowledge and experience which we will have gained in securing our degrees as pharmacists.

RALPH R. FORAN,

President P.D. Class 1917,

A. E. CLAPHAM,

Secretary.

M. S. GEHMAN,

President Ph.G. Class 1917,

E. B. POWELL,

Secretary.

Mr. French stated he had prepared a letter to be sent to the president of the United States as requested by the senior classes as follows:

TO THE PRESIDENT,

Washington, D. C.

Dear Sir: By request of the senior classes of the Philadelphia College of Pharmacy, I have the honor herewith to submit resolutions which they have respectively adopted offering their services as pharmacists to the government should an occasion arise to require them. There are 304 students in the two classes, their final examinations will be held in May, and their degrees will be conferred on June 6, 1917. Their practical experience and knowledge will, no

doubt, be of material benefit in several of the departments of the government.

Trusting that the two classes referred to may prove of service to the government, I have the honor to be,

With respect,

HOWARD B. FRENCH,
President.

March 26, 1917.

The discussion that followed was participated in by Messrs. Beringer, Boring, Kraemer, Thum, Remington and Weidemann, when, on motion of Professor Kraemer, the action of the president was approved. Professor Remington suggested that as the senior classes had offered their services to the government, why not also should the officers and faculty tender their services?

When Mr. Beringer moved that the College recommend to the board of trustees to "consider and formulate some plan showing the desire of the College to coöperate with the government in the present condition of affairs in the nation," seconded and so ordered.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

December 5, 1916. Fifteen members were present. The committee on announcement and publicity reported on a map recently prepared by Professor Sturmer which shows the states furnishing the first-year students. Professor Remington was given authority to prepare and issue a calendar for 1917. Mr. French stated that the cases borrowed by the College for the recent exhibit could be retained for the present.

Mr. Cliffe referred to the activities of the Philadelphia Chamber of Commerce and thought the College should become a member of it. Mr. French spoke of the proposed Pennsylvania State Chamber of Commerce and thought the College should also become a member of same. Others members approved of the suggestion and the matter was referred to Mr. French for further action.

Mr. French referred to the meeting of the deans of the several colleges of pharmacy, the Pennsylvania State Board of Pharmacy and representatives from the colleges of pharmacy in the state, held several years ago relative to establishing a council governing professional educational matters in this state, stating that the time was now ripe for such a move. The committee appointed in 1913 was still active and the matter was left in their hands.

Julius W. Sturmer, Frank H. Rohrman, Paul S. Pittinger, Charles E. Vanderkleed, Robert P. Fischelis, Russell T. Blackwood, John A. Roddy and Mrs. Nellie F. Lee were elected to active membership in the College.

January 2, 1917. Eleven members were present. The committee on scholarships reported the award of two additional scholarships.

The committee on examination presented the names of gentlemen upon whom they recommended that the degree of Master in Pharmacy (Ph.M.) be conferred at the coming commencement. In accordance with the by-laws the names were referred to a special committee, who will report at the next meeting.

February 6, 1917. Fourteen members were present. The committee on property read a communication received from the Bureau of Water, relative to installing water meters in the College. The committee after thorough investigation, recommended that meters be installed. On motion, the committee was given power to act.

Mr. French stated that an appraisal of the entire building had been made by an expert, but that the valuation given did not include the power plant nor the fixtures. He also read a communication from the insurance agents advising an increase in the insurance. On motion, the committee was empowered to place an additional \$25,000 insurance on the buildings and \$25,000 additional insurance on the contents of same.

The committee on library reported receiving a number of gifts, among them being a copy of the Philadelphia Year Book, 1917, issued by the Philadelphia Chamber of Commerce. It contains a two-page article about the College. An edition of 5,000 copies in Spanish and 7,500 copies in English will be distributed. 479 persons used the library during the month.

The committee on instruction reported that courses for the various post-graduate degrees were being prepared.

They also reported that it was found necessary to revise the diplomas because of changes in the courses of instruction, and a special committee consisting of George M. Beringer, Joseph P. Remington and William L. Cliffe was appointed to consider the matter.

Dr. J. Edward Brewer, assistant in the department of chemistry, tendered his resignation to accept a commercial position, but stated that he would continue his instructions for the remainder of the term.

The following named gentlemen (previously reported upon) were elected to receive the honorary degree of Master in Pharmacy (Ph.M.) at the next commencement: Julius W. Sturmer, Philadelphia; William B. Day, Chicago; Frederick J. Wulling, Minnesota, and John K. Thum, Philadelphia.

ANNUAL ADDRESS OF THE PRESIDENT OF THE PHILADELPHIA COLLEGE OF PHARMACY.

During the past year much has occurred that should be of interest to the members, therefore, your president will follow the custom which he started some years ago of submitting for your consideration a concised summary of what has occurred in your institution during the past year.

Some changes have been made in the arrangement of the interior of your buildings. Shelving has been placed in the fourth floor room, formerly occupied as a gymnasium, for the storage of surplus books, which had previously been stored in the basement under the library. This enabled your property committee to remove the temporary partition and to take the lockers from the center section of the basement and place them in the south portion—thus giving additional room for use in serving lunch to the male members of the class. In addition to the old lockers, your committee on property has placed 25 lockers of metal construction in the basement. They also have had the former reading room divided in half; the rear portion of which is used by women students for their lunch room, while the front half has been transformed into an office for the associate dean, with a door opening from it into the passageway of the main office. This has given additional facilities for the transaction of business and added greatly to the comfort of those in charge.

The bacteriology laboratory has been rearranged and refinished so that now it is one of the most attractive rooms in your buildings.

The old Alumni Hall has been transformed into a microscopical laboratory.

During the Christmas holidays, steam radiators were placed in Professor Kraemer's special microscopical laboratory on the fourth floor and also in the associate dean's office, which added much to the comfort of those using these departments. This work was largely done by your engineer, and thus the cost of same was reduced to a minimum.

Your committee on property found it necessary to secure another caterer to take charge of the lunch room at the opening of the school last fall. The serving of lunch in the college has proven most advantageous to the students and employees of the college, and while there has been some complaint, it is thought that the luncheons are of reasonably good quality and served at a moderate price.

Taking your property as a whole, it is in reasonably good repair, and while a thorough coat of paint upon the outside woodwork would prove a benefit, it is not being greatly damaged for the want if it.

Owing to the very rapid rise in building materials, your committee on property deemed it prudent to have a reappraisal made of the cost of replacing your buildings, and they reported to your board of trustees that an additional \$25,000 insurance should be added to the amount already upon your buildings. They also recommended that an additional \$25,000 insurance be placed upon the contents of your buildings, both of which were ordered by your board of trustees.

A committee of your college aided a committee of the Alumni Association in celebrating the fiftieth anniversary of the Alumni, having planned and carried out an exhibition of "Ancient and Modern Pharmacy," which remained open from August 30 to September 30, 1916, and was very largely visited by physicians, druggists and others interested in scientific pursuits.

The number of matriculants for the session 1916-17 total 628, which are divided as follows:

First-year matriculants numbered 226, of which 8 did not begin the course, and 25 were in but partial attendance, which reduced the number to 193. Six students repeated the second semester of the first year, making 199, while one special student brings the total of the first year students up to 200.

The second year class had 198 matriculants, 5 of whom did not attend and 11 only attended lectures for a short period, which reduced the number to 182; out of this number 6 second-year students were called upon to take the second semester of the first year, making the total number attending the second-year class 176.

The third-year class consisted of 134 matriculants, 3 of whom did not begin their course of lectures and 3 attended only partial lectures, thus reducing the number to 128.

45 students are taking the special chemistry course,

6 students are taking the food and drug course,

8 students are taking the pharmaceutical chemist course.

There are also 7 special students in bacteriology, three of whom are graduates of your institution. Thus the total attendance at the present time is 570 students.

On Monday morning, September 25, 1916, the college session was opened, under rather unusual conditions. Dean Remington presided and Ex-Governor Edwin S. Stuart, Dr. Edgar F. Smith, provost of the University of Pennsylvania, Prof. J. W. Sturmer and your president, each delivered a short address to the students, after which the classes had an opportunity of viewing the exhibits.

Your college now has seven courses of instruction, namely:

2 years' course (Ph.G.)—Graduate in Pharmacy,

3 years' course (P.D.)—Doctor of Pharmacy,

3 years' course (Ph.C.)—Pharmaceutical Chemist,

4 years' course (B.Sc.)—Bachelor of Science in Pharmacy and Chemistry.

for the above, diplomas are awarded.

In addition to these, you have:

3 years' course in analytical and industrial chemistry,

2 years' course in food and drug analysis,

Special course in bacteriology.

For these three courses, certificates are awarded.

The department of pharmacy not only teaches theory and practice, but operative pharmacy and commercial pharmacy—all of which, owing to the enlarged classes of the present session, required much thought and care to rearrange the instruction to meet the situation properly and effectively.

The professors and assistants in the department have cheerfully given their time and talent in aiding to make the result most satisfactory. There will have to be, however, some modification in existing arrangements so as to facilitate the teaching in this department to somewhat relieve the double work which in some cases have been necessarily imposed upon the professors and instructors in that department, owing to the duplication of lectures, etc.

The custom of visiting manufacturing establishments, which was inaugurated many years ago, will be continued and it is fortunate for the students that notwithstanding the extraordinary conditions now existing that the third-year graduating class and the second-year graduating class have been invited by the manufacturers to make,

on separate occasions, an annual visit. This must necessarily involve considerable expense to the establishments, for which your president is sure the membership of the college feels duly indebted.

The professor of pharmacy in his report expresses his appreciation and makes very complimentary reference to those who assisted in his department.

It may be of interest for you to know that the large class this year and the complications that have risen by having two senior classes, one three-year and one two-year, made it necessary to repeat the senior laboratory instruction five times, which greatly increased the number of hours of class instruction and rendered necessary the appointment of another assistant to aid in the laboratory work.

The stock room connected with the laboratory of this department is being reorganized so as to concentrate the stock and make it more available and easy of access.

Your chemical laboratories have never been so active as during the present session. In the annex laboratory accommodations had to be provided for eight students taking the B.Sc. course, 6 students taking the food and drug course, 7 students taking the Ph.C. course and 45 students taking more or less complete special chemistry courses; of the last number, 8 are graduates in pharmacy. In the old laboratory instruction was given to the first-year pharmacy students in two sections, and to the second-year pharmacy students in three sections, and in the first semester, to the third-year pharmacy students in two sections. This meant seven half-days per week of class instruction. In the remaining open time, many students availed themselves of the opportunity to do extra laboratory work; thus, 47 first-year students, 38 second-year students (6 on theses subjects) and 26 third-year students (18 on theses subjects) were enrolled.

The above statement does not include students who, failing in their laboratory examinations, had to do some extra work in preparation for a reëxamination.

Under the very able direction of your professor of botany and pharmacognosy, the collections in your museum have been rearranged, classified, relabelled and are now in a monographic form. They now comprise the following subjects: Aloes, chocolate and coffee, opium, licorice, sarsaparilla, cascara, cinchona, spigelia, hydrastis, belladonna and progress in the cultivation of medicinal plants. Each collection includes the commercial varieties of crude

drugs, and in some instances the containers in which they were shipped in commerce. There is also included chemical constituents and photographs illustrating the plants from which they are derived.

The Maisch collection has been removed to and properly arranged in the new microscopical laboratory, while for want of space many specimens and stock of unofficial drugs have been stored in the old gymnasium. Quite a little progress has been made in securing original containers and steps are now being taken to make this collection a representative one. It would be a most difficult task to estimate the exact number of specimens in pharmacognosy, but roughly estimated there is probably not less than 10,000 in number. They are all in most excellent condition and are constantly increasing in value both for illustrative purposes and for comparison and research.

The Martindale and other herbariums, containing nearly 200,000 specimens, have been largely used during the past year, not only by your department of pharmacognosy, but by scientific workers from other institutions who have repeatedly sought the privilege of examining these most interesting specimens.

The cultivation of medicinal plants in your roof hothouse has had much attention, and while the facilities are very meager, material results have been obtained. The hothouse has enabled your department to conserve specimens which have been sent to the college and the facilities thus afforded have added much to the interest of visitors and students in facilitating the recognition by them of the growing specimens.

During the past year many specimens have been forwarded to your institution by graduates of your college, living in different parts of the United States, asking that the specimens be identified and every assistance has been rendered to help them in the identification of the specimens submitted.

It may be of interest for you to know that a large number of lantern slides have been made and many of them colored, showing the living plant, the microscopic structure, diagnostic characters and color reactions. It is now possible for your department to throw upon a screen a picture of the crude drug, as seen at close range, and illustrate every stage of the examination by the microscope and use of reagents. This adds greatly to the educational value of the work and tends not only to illuminate the subject and increase the didactic efficiency, but makes it possible to illustrate the material

before large audiences whenever called upon to demonstrate the practical value of what we are doing for the profession.

It may also interest you to know that a number of special students are making investigations as a basis for their thesis. This, in the judgment of your professor, is a source of great stimulation to the students and demonstrates that quite a number of them have initiative and possess a desire for research work, and it is hoped by your president that at no distant future, greater opportunities can be afforded whereby students can follow out their investigations.

Your institution has been handicapped by the lack of facilities for conducting a botanical garden, and your president, a year ago, expressed the hope that the city or state would provide not only the ground, but the means for conducting a suitable botanical garden, to assist the educational institutions of Philadelphia in the advance study of botany and pharmacognosy, but as yet nothing has been accomplished. In your president's opinion, nothing would add greater luster or bring more lasting fame to Philadelphia as a pharmaceutical and medical center than the establishment of such a garden.

Your department of bacteriology with its improved surroundings and most excellent equipment has maintained its usual high character of instruction. Your professor in charge of same has recently offered some suggestions which at the proper time will be taken up by the committee on instruction.

Instruction in the departments not mentioned above has been conducted in the usual way and but little comes to the attention of your president that he deems necessary to take your time to report.

Your emeritus professor of chemistry, Samuel P. Sadtler, has given lectures on chemical topics that have been most instructive and our thanks are due for his earnest coöperation in the continued success of the college.

The recording of attendance of students has been continued and it is the thought of those in charge that it has proven quite an incentive for closer application of those attending the college.

Your 95th Annual Commencement was held on Wednesday evening, June 7, 1916, at the American Academy of Music. Prayer was offered by the Rev. Herman S. Cook, and a most able and stirring address was delivered by Rev. John G. Wilson, D.D. Announcements were made by Dean Remington and your president conferred the degrees upon graduates who numbered 154—20 more than the

preceding year. Eleven states and 7 foreign countries were represented.

In this connection it may interest you to know that the study of pharmacy and kindred branches is yearly becoming more of interest to women and at the present time the college has 38 women attending the classes.

During the past year 13 members have been elected to your organization; 2 have died, 1 resigned and 7 forfeited membership, thus making the total present membership 144. You have 14 associate members, 1 elected during the past year.

The position of associate dean, created by your board, early in the fall, has proven most advantageous and has assisted materially in advancing the interest of the institution. As a matter of record it seems proper that your president should report that after numerous interviews and conferences, extending over a period of many months, an agreement of consolidation between the pharmacy branch of the Medico-Chirurgical College and the Philadelphia College of Pharmacy was accomplished, and on August 15, 1916, the final communication referring to same came from Provost Edgar F. Smith to your executive.

The consolidation has added greatly to the prestige which Philadelphia has for so many years enjoyed as a pharmaceutical center. The students of the pharmacy branch of the Medico-Chirurgical College and the Philadelphia College of Pharmacy have joined most heartily with each other in assisting to make the consolidation a great success, and your president wishes to extend to the associated students his appreciation for their active and earnest coöperation.

The consolidation required many changes in your curriculum and brought into active and official coöperation with your faculty, the following gentlemen, who were formerly connected with the pharmacy department of the Medico-Chirurgical College: J. W. Sturmer, Charles E. Vanderkleed, Frank E. Stewart, M.D., Heber W. Youngken, Robert P. Fischelis, J. Edward Brewer and Paul S. Pittinger. They have been most earnest in their efforts to coöperate with and aid the teaching force of your institution, and your president cannot allow this opportunity to pass without expressing to them on behalf of the membership of the college, appreciation for their earnest endeavors.

Respectfully submitted,

HOWARD B. FRENCH.

March 26, 1917.

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THE PHARMACY OF CALCIUM GLYCEROPHOSPHATE.

By JAMES F. COUCH, WASHINGTON, D. C.

The following communication contains an account of certain experiments designed to furnish knowledge of the behavior of calcium glycerophosphate in solution and the effect upon the salt of those substances which are commonly associated with it in pharmaceutical mixtures. In a consideration of this substance one must always remember that the commercial salt is a mixture of two isomeric compounds in varying proportions depending upon the details of manufacture; the isomerism being essentially that of substituted propyl and isopropyl groups. This fact in itself lends so much uncertainty to the chemical that no one would be justified in presenting the results of experiments in which the mixture had been used without a statement of the relative proportions of the isomers if the last Pharmacopœia did not recognize the mixture as the official substance. I have not been able to find a reliable method for the separation of the isomers and cannot, therefore, state the composition of the salt used in these determinations. Analysis, however, showed that it easily conformed to the tests of the Pharmacopœia.

In this investigation the first step was the compounding of the two preparations in the National Formulary which contain calcium glycerophosphate (if we are to have abbreviations why not "glycphos" instead of the longer official term?). It was found that the amount of calcium glycerophosphate directed was not completely soluble in either of the official menstrua, the consequence of which is that its proportion in the finished elixir will vary with the skill of the pharmacist, the temperature of the laboratory and the composition of the salt he employs. By directing the addition of purified talc to the compound elixir and immediate filtration the

National Formulary obscures the fact of the insolubility of the calcium glycerophosphate and the pharmacist may be led to believe—unless he be of a critical turn of mind—that each liter of his finished elixir contains 16 Gm. of calcium glycerophosphate.

The Compound Elixir of the Glycerophosphates, N. F. IV, was prepared with rigid adherence to the directions except that the purified talc was omitted and the mixture was not immediately filtered. A large proportion of the calcium salt was found out of solution, not having been dissolved and then precipitated on the addition of the alcohol which might have happened. It had never been dissolved and no other manipulation would cause its solution. This mixture was allowed to stand two days at room temperature with occasional shaking in order that there might be no doubt of the establishment of equilibrium. A considerable precipitate remained.

The mixture was now divided into four equal portions. The first portion was filtered, made up to volume through the filter, bottled and set aside for analysis. To the other three portions lactic, citric, and phosphoric acids were severally added in small amounts until the insoluble matter was dissolved. 4 Gm. of citric acid per liter dissolved the precipitate in one portion. This solution began to deposit calcium citrate within a week and the precipitation continued until the acid was exhausted. A third portion required 40 mils of U. S. P. phosphoric acid per liter to completely dissolve the precipitate and this solution quickly became cloudy as a heavy precipitate settled out. In the fourth portion the undissolved calcium salt was brought into solution by lactic acid in the proportion of 30 mils per liter and this solution, which was not filtered, shows only a barely perceptible cloudiness after standing three months. This mixture now contains 40 mils per liter of lactic acid which is sufficient to dissolve and retain in solution 16 Gm. per liter of commercial calcium glycerophosphate.

Lest the use of the term "commercial" in the above paragraph lead to misunderstanding let me add that the adjective was used to designate the mixture of isomers found in commerce which conforms to the requirements of the Pharmacopœia. All of the materials used in this investigation complied with the standards of the U. S. P. IX or N. F. IV, unless otherwise stated.

The first portion was analyzed for calcium glycerophosphate. 29.57 mils gave 0.00826 Gm. of calcium oxide corresponding to 11.72 Gm. calcium glycerophosphate per liter, or 73.36 per cent. of the formulated amount.

The discovery that the official elixir actually contains only 75 per cent. of the calcium glycerophosphate directed was disconcerting but not entirely unexpected, for after several years' experience with glycerophosphate mixtures I did not believe that the N. F. IV formula was so adjusted that it would dissolve 16 Gm. of the salt.

An experimental batch of elixir calcium and sodium glycerophosphates N. F. IV was now made to determine the satisfactory character of this formula. The ingredients were manipulated according to the N. F. directions; the calcium salt completely dissolved in the diluted phosphoric acid: upon the addition of the sodium glycerophosphate solution a white precipitate appeared at first but redissolved when all the solution had been added. A faint cloudiness was produced when the glycerin was mixed in and this became pronounced when the aromatic elixir was added. The mixture was made up to volume with water which did not redissolve the precipitate; one half of the mixture was filtered, the other half was bottled without filtration.

The filtered portion precipitated within twelve hours: it was refiltered and allowed to stand. Another precipitate formed in four hours. Lactic acid was now added to this in the proportion of 15 mils per liter; the precipitate was redissolved and after standing three months the amount of precipitation was inappreciable. The unfiltered portion continued to precipitate until a large deposit covered the bottom of the container.

From these experiments it appears that neither of these formulas is wholly satisfactory. In order to compete with proprietary preparations now in commerce the compound elixir must contain approximately 8 grains and the dual elixir 4 grains of calcium salt per fluidounce.

One of the best known proprietary brands of the compound elixir was submitted to analysis. One fluidounce yielded 0.1186 Gm. calcium oxide, equivalent to 6.854 grains of calcium glycerophosphate. This preparation had apparently been filtered after precipitation: it was labelled 8 grains. Tests showed the presence of free phosphoric and lactic acids.

It was then decided that the solubility of calcium glycerophosphate should be determined under various conditions and, if possible, a combination was to be found which would retard the hydrolysis of the salt.

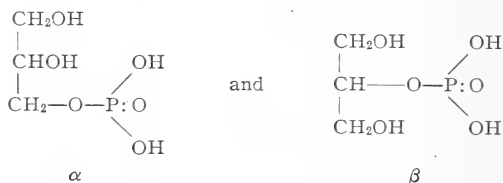
All work with the U. S. P. substance is complicated by the fact

that the solubilities of the isomers are quite different and where the relative proportion of the two is unknown one cannot adopt the usual method for determining the solubility of the salt—that of shaking the solvent with an excess of solute at definite temperature and analyzing the solution—for, as DuBois¹ has pointed out, such a solution will contain a larger proportion of the more soluble isomer than the original mixture. On the contrary, solvent must be added to a weighed portion of the salt until it dissolves in order that the solution may truly represent the original compound. To verify this the solubility of the salt was determined by each method. The first procedure in which an excess of salt was used gave a solubility in water of 1:31.59 at 25° C., while the second method yielded the result 1:56.95 at the same temperature. Most of the solubilities reported in the following experiments were determined by the latter method: the first method was used in some comparative experiments. All determinations were made at 25 degrees C.

Before entering upon a discussion of these determinations, however, we may profitably review the present knowledge of calcium glycerophosphate.

The U. S. P. IX states that its solubility in water at 25° is about 1:50; DuBois¹ says commercial calcium glycerophosphate should dissolve in 40 to 50 parts of water at 20 degrees. In this work the solubility was determined as 1:56.95 at 25°.

The commercial product is a mixture of α and β calcium glycerophosphates derived from isomeric α and β glycerophosphoric acids whose relationship is shown by the following structural formulas:



Salts of the diglycerophosphoric acids may also be present in the commercial salt as impurities but are excluded by the alcohol-soluble tests of the Pharmacopœia.

The solubilities of the isomeric calcium salts is given¹ as:

¹ "The Chemistry and Properties of Glycerophosphates," read before the pharmaceutical division of the American Chemical Society, September 10, 1913.

α (anhydrous)	1:22 at 20°.
α "	1:108 at 100°.
α "	1:22.4 at 16°. (Power and Tutin. ²)
β "	1:60 at 20°.

Both isomers are insoluble in alcohol.

Acids increase the solubility of calcium glycerophosphate in water but those acids which form insoluble calcium salts gradually produce a precipitate in the solution, which is undesirable. In addition, any admixture with acid increases the rate of hydrolysis of the glycerophosphoric acid so that, even in the presence of acids which do not form insoluble calcium salts, a precipitate of secondary calcium phosphate may be produced unless the proportions of acid and salt are so adjusted that the soluble primary calcium phosphate is formed. Lactic acid appears to be eminently fitted for this purpose. Citric, phosphoric, and tartaric acids are objectionable because they lead to precipitation and other acids are excluded for therapeutic reasons or pharmaceutical inelegance.

EXPERIMENTAL.

1. *Influence of Alcohol upon the Solubility of Calcium Glycerophosphate in Water.*—For this purpose a solution made by saturating water with the salt at 25° was used. The solubility was 1:31.59.

A. To 35 mls of solution 1.5 mls of alcohol were added. A flocculent precipitate immediately appeared. The mixture was shaken and allowed to stand until precipitation was complete. The precipitate was filtered off, washed with a small quantity of 5 per cent. alcohol, dried at 110°, and weighed. Wt. ppt. 0.2308 Gm.

B. To 34.7 mls of mother liquor from experiment *A* 1.9 mls of alcohol were added. A precipitate was produced which was treated as in *A* except that it was washed with 10 per cent. alcohol. Wt. ppt. 0.2195 Gm.

C. To 33.8 mls of filtrate from experiment *B* 0.9 mls of alcohol were added. The precipitate produced was treated as in *A* and *B* except that it was washed with 12 per cent. alcohol. Wt. ppt. 0.1366 Gm.

Solution *A* contained about 5 per cent. alcohol by volume, *B* about 10 per cent. and *C* about 12 per cent. The solubility of calcium glycerophosphate in diluted alcohol at 25° is therefore:

² *Jour. Chem. Soc.*, 87, 240 (1905).

In 5 per cent. alcohol	I : 41.6
In 10 per cent. alcohol	I : 55.6
In 12 per cent. alcohol	I : 66.6

assuming that the composition of the precipitate is the same as that of the original salt. The method here employed gives quantitative results only for the case where the solute is in excess as before stated. It does show, however, that small amounts of alcohol markedly repress the solubility of the salt.

2. *Influence of Acids upon the Solubility of Calcium Glycerophosphate in Dilute Alcohol.*—*A.* To 25 mls of the saturated solution used in the first series 0.33 mil of lactic acid was added. Alcohol was now added drop by drop and thoroughly mixed in until a permanent cloudiness was produced. The total volume was 31.9 mls. Allowing 3 per cent. for shrinkage the alcoholic content of the mixture was nearly 23 per cent. by volume and the solubility was about 1 : 40. Thus, 1 per cent. of lactic acid increases the solubility of the salt so that 23 per cent. alcohol equals the solvent power of 5 per cent. alcohol without such addition.

B. To the foregoing 0.9 mil of lactic acid was added which redissolved the precipitate. Alcohol was added to permanent cloudiness as before. The final volume was 101 mls and the alcoholic content nearly 72 per cent. The acid concentration was 1.22 per cent. and the solubility about 1 : 128. Without the acid calcium glycerophosphate would be scarcely soluble at all in 72 per cent. alcohol.

C. To 25 mls of the saturated solution 3.5 mls (12 per cent.) of alcohol were added. A precipitate occurred which was redissolved by 0.2 Gm. citric acid. Within twenty-four hours a crystalline precipitate of calcium citrate appeared.

D. To 25 mls of the saturated solution 3.5 mls of alcohol were added and 0.6 mil of U. S. P. phosphoric acid were used to redissolve the precipitate. This solution became cloudy in a short time, but did not deposit a precipitate.

E. To 25 mls of the saturated solution 3.5 mls of alcohol were added. 0.6 mil of lactic acid redissolved the precipitate. Solution has remained clear for three months.

3. *Influence of Glycerin upon the Solubility and Hydrolysis.*—*A.* To 75 mls of the saturated solution 25 mls of glycerin were added. In 8 days the solution became cloudy; in 7 days more a precipitate settled out.

B. On the same date 100 mls of a saturated solution of calcium glycerophosphate in water made by the second method was prepared and set beside the above solution, both being securely stoppered. This solution precipitated in three days and at the end of a month there was fully ten times as much precipitation in the aqueous as in the glycerin solution. These experiments show roughly that, while glycerin does not prevent the hydrolysis of the calcium glycerophosphate, it does retard it.

C. 1.75 Gm. calcium glycerophosphate were treated with 100 mls of a 25 per cent. solution of glycerin in water. The salt was not quite completely soluble. This quantity was just soluble in 100 mls of water.

D. To the foregoing solution 0.5 mil of lactic acid were added. The remainder of the calcium salt dissolved. The solution precipitated in the same fashion as in experiment A and to the same extent. This indicates that glycerin retards the hydrolysis in acid solutions also.

4. *Joint Influence of Alcohol and Glycerin on the Solubility of Calcium Glycerophosphate.*—A. An aqueous mixture containing 12.5 per cent. of alcohol, and 25 per cent. of glycerin was employed. 100 mls were added to 1.75 Gm. of the calcium salt. Very little dissolved. 3 mls of lactic acid were sufficient to effect the solution. This solution did not precipitate; in three months a small cloudiness only was visible.

5. Influence of sodium glycerophosphate solution upon the solubility of the calcium compound.

A. An aqueous solution of the U. S. P. solution of sodium glycerophosphate which contained 40 Gm. per liter (or the same strength that is used in the N. F. compound elixir) was employed to dissolve 1.75 Gm. of the calcium salt. Required 178.85 mls of solvent. Solubility, 1:102.2 at 25°. The calcium compound is, therefore, only half as soluble in this solvent as it is in water. In addition, this solution hydrolyzed rapidly.

6. Influence of alcohol, glycerin, and sodium glycerophosphate upon the solubility of calcium glycerophosphate in lactic acid solution.

A. 1.75 Gm. of the calcium salt were treated with a solvent composed of 12.5 per cent. alcohol by vol., 25 per cent. glycerin, 40 Gm. per liter of sodium glycerophosphate solution U. S. P. and 1 per cent. of lactic acid. Required 294 mls of solvent. Solubility, 1:168 at 25°.

The influence of sodium citrate upon the solubility was roughly determined. It was found that an admixture of 20 per cent. of this salt increased the solubility from 1:57 to 1:32 and that the solubility of calcium glycerophosphate in a 1:250 solution of sodium citrate was 1:41. Both of these solutions quickly precipitated calcium citrate.

SUMMARY.

It has been shown that,

1. The solubility in water of calcium glycerophosphate is increased by acids and by sodium citrate.
2. The solubility in water is repressed by alcohol, glycerin, and sodium glycerophosphate solution.
3. Lactic, citric, and phosphoric acids increase the solubility in presence of alcohol or glycerin or both.
4. Acids hasten the hydrolysis of the salt-producing precipitates except that lactic acid tends to keep the hydrolytic products in solution.
5. Alcohol and glycerin repress the hydrolysis even in the presence of acids.
6. In the N. F. formula for the compound elixir the lactic acid should be increased to at least 40 mils, and in the formula for the calcium and sodium glycerophosphate elixir the phosphoric acid should be replaced by at least 20 mils of lactic acid.

DISCUSSION.

The use of various acids in order to increase the solubility of calcium glycerophosphate so that an effective amount of it may be presented in the old-time teaspoonful dose, while highly necessary for pharmaceutical reasons, is, nevertheless, quite undesirable from chemical considerations. The addition of acid causes the formation of free glycerophosphoric acid, which undergoes autohydrolysis,³ the free hydroxyls of the acid acting as the catalyst, so that, eventually, the mixture consists of a calcium salt, free added acid, glycerin, and phosphoric acid. There may then be little or no true glycerophosphates in the solution. Not only will this occur with the calcium salt but it will obtain with all glycerophosphates in acid solution. Self⁴ suggested the addition of sulphuric acid in making acid glycerophosphates and DuBois¹ states that these compounds are

³ Malengreu and Prigent, *Zeit. physiol. Chem.* (1911), 73, 68-84.

⁴ *Pharm. Jour.*, May 16, 1908, p. 627.

less stable than the neutral salts. All the proposed formulas employ some acid: Dunning⁵ used hypophosphorous acid, later changing to lactic; the Australian Pharmaceutical formulary,⁶ Griffiths,⁷ British Pharmacopœia,⁸ all use phosphoric acid.

In addition to the objection which arises from the hydrolysis of the compound another, and more serious, danger bids us hesitate to add weak organic acids to such elixirs. The compound elixirs of the glycerophosphates all contain a quinine salt. It has been shown that weak organic acids cause an intramolecular rearrangement in quinine which results in the formation of quinotoxine,⁹ a highly poisonous ketone to which fatal consequences have been attributed. No undesirable results from this cause have as yet been reported in the case of the glycerophosphate elixirs.

In view of these facts it would probably be best to eliminate liquid preparations of the glycerophosphates and to supply the small demand with tablets or powders. Whatever the therapeutic value of the glycerophosphates may be¹⁰ their efficacy cannot be demonstrated to advantage by a liquid full of their hydrolytic products.

A discrepancy will be observed in the results for the solubility of the calcium glycerophosphate as observed in the compound elixir and in experiment 6A. The first shows a solubility of 1:85 while the latter gives 1:168. This is due to the fact that in the case of the elixir an excess of solute was present so that a larger proportion of the more soluble isomer entered solution than in experiment 6A.

AN INTERESTING PRESCRIPTION.¹

By L. F. KEBLER, Ph.C., M.D.

I desire to call attention to what appears to me a unique combination of drugs and some incidents connected therewith. A patient was suddenly taken seriously ill after taking some medicine put up

⁵ *Proc. A. Ph. A.*, 54, 616 (1906).

⁶ Druggists' Circular formula book, p. 6 (1915).

⁷ "Non-Secret Formulas," p. 321 (1910).

⁸ Quoted in Hiss and Eberts's "Pharmaceutical Preparations," p. 409 (1908).

⁹ v. Miller and Rhode, *Ber.*, 28, 1056; Scoville, *Jour. A. Ph. A.*, May, 1916, p. 590.

¹⁰ *Jour. A. Med. A.*, LXVII, No. 14, p. 1033 (September 30, 1916).

¹ Read at the Kansas City meeting of the American Chemical Society, 1917.

on order of a physician by a pharmacist. The medicine was suspected and immediately discontinued. The question naturally arose as to whether or not a mistake had been made in compounding the prescription, which was known to contain corrosive sublimate. The unused pills were turned over to me, a friend of the family, with a view of having the amount of mercuric chloride estimated, so that suitable treatment could be instituted if found necessary. A copy of the prescription, which follows, was procured:

R Hydrarg. Bichloride Grs. $\frac{1}{60}$.
Sulphur Præcip. Drams 2.
Ol. Theobromæ Q.S.

Pil. XXX.

Sig: One before meals t.i.d.

Dr. _____

It will be observed that this mixture calls for $\frac{1}{60}$ of a grain of corrosive sublimate, 4 grains of sulphur, and an indefinite amount of cocoa butter to each pill. A number of points must be considered in making an examination of a mixture of this character. First, variability in the weight of the pills. Second, chemical reactions which may interfere with the estimation of the corrosive sublimate. Third, method of analysis. Fourth, uniform distribution of the mercuric chloride. These points will be taken up in the above order.

First, variability of weight of pills. Twenty of the pills were weighed with the following results:

	Grams.	Grains.		Grams.	Grains.
1.....	0.52	8.0	11.....	0.53	8.2
2.....	0.50	7.7	12.....	0.54	8.3
3.....	0.54	8.3	13.....	0.59	9.1
4.....	0.55	8.5	14.....	0.53	8.2
5.....	0.53	8.2	15.....	0.51	7.9
6.....	0.47	7.2	16.....	0.56	8.6
7.....	0.51	7.9	17.....	0.53	8.2
8.....	0.52	8.0	18.....	0.49	7.6
9.....	0.54	8.3	19.....	0.55	8.5
10.....	0.55	8.5	20.....	0.52	8.0

Weight.	Grams.	Grains.
Maximum	0.59	9.1
Minimum	0.47	7.2
Average	0.53	8.2

Percentage variation from the average: 2 slightly exceed a 10 per cent. variation from the average; 3 exceed a 5 per cent. variation from the average.

From a study of other subdivisions of medicines these variations, considering the character of the article, are reasonable.

Second, chemical reactions. There appeared to be no reaction at the time the material was received, nor at the end of two years. In discussing this matter with the prescribing physician he stated in substance that this mixture enabled him to give very large doses, as large as 2 grains of the mercuric chloride, without any untoward effects. He considered this a very important observation in that it may be possible by this mixture to inhibit undesirable intestinal fermentation. It was suggested that possibly the mercury may be converted into an insoluble sulphide, thus rendering it inert, but no information on this point has been found.

Third, method of analysis. It can readily be seen that the large amounts of sulphur and cocoa butter would tend to make the determination of the mercuric compound rather difficult. Neither incineration nor sublimation was possible. A little experimentation showed that petroleum ether dissolved the sulphur and cocoa butter and practically none of the mercuric chloride. The method used for estimating the mercury compound was as follows:

A number of pills, accurately weighed, were introduced into a beaker, a sufficient amount of petroleum benzin was added to completely disintegrate the pills and dissolve the greater portion thereof; the mixture was then transferred to a separatory funnel, the beaker rinsed with several successive portions of the benzin and transferred to the above separatory funnel. The benzin mixture was then treated with several successive portions of water, acidulated with hydrochloric acid, the successive aqueous portions transferred to a beaker through a funnel, in the throat of which a pledget of cotton was lodged. After the benzin solution was completely extracted with the acidulated watery solution and the latter transferred to the beaker, the mercury was precipitated with gaseous hydrogen sulphide. The mercuric sulphide obtained was transferred to a weighed Gooch crucible provided with a suitably prepared filter, the precipitate washed with water, then with alcohol, and finally with ether to dissolve any free sulphur. The crucible and contents were then dried to constant weight at 110° C. in a hot air oven and the weight determined. From the data available the amount of mercuric chloride was calculated. The amount found was somewhat less than called for by the prescription. The pharmacist apparently endeavored to lean on the side of safety in filling an order calling for so potent a poison to be taken internally.

Fourth, uniformity of distribution. It is of course impracticable to analyze each pill separately, but an examination of several successive portions showed that the distribution was fairly uniform.

In conclusion it should be stated that if this mixture were given to a chemist for analysis without any knowledge on his part as to the presence of the mercuric chloride he would in all probability overlook it.

BREEDING FOR ATROPINE¹

GREAT VARIATION IN ALKALOIDAL CONTENT OF BELLADONNA PLANTS PROMISES RESULTS TO SELECTION—
EXTERNAL CHARACTERS OF PLANT SEEM TO GIVE
A CLUE TO ITS CHEMICAL CONTENT.

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The high prices paid for crude drugs, brought about by the abnormal economic conditions of the last few years, have stimulated a wide and popular interest in the cultivation of the plants yielding these products. Unfortunately for the crude drug industry, a great part of this interest has been aroused merely from a view toward financial investment and the real issues at hand have been generally overlooked.

There is no question but that America must grow a large part of her drug supply in the future since the drug importations are yearly becoming less dependable. The adulterations which are being made by collectors of crude drugs render the purchase of these plants upon the open markets extremely unsatisfactory and if the American manufacturer of pharmaceuticals is to produce articles of high grade, he must either grow his own vegetable drugs or obtain them from someone who he knows is growing them honestly.

Certain economic facts, however, must be considered. Competition with European peasant labor greatly reduces the chances of financial profit from American production, and unless some step can be taken to produce drugs superior to those of European origin, no hope can be found for such an industry in America upon a purely financial basis. It is probable, however, that such improvement can be brought about, and the competition will be changed from quantity

¹ Reprinted from *Jour. Heredity*, April, 1917, Vol. III.

against quantity to quality against quantity. Stating the case in a more simple way it may be said that financial success in the cultivation of drug plants depends upon the possibility of increasing the alkaloid content of these plants by plant breeding methods.

The object of this paper is to point out to breeders who are interested in this field of work the opportunity which these plants offer for selective methods of improvement. The resulting improvement from research work in this direction not only will afford the satisfaction which is coincident with accomplishment, but will provide raw materials of uniform and high quality to the exacting professions of medicine and pharmacy. This surely then is a worthy field for experimental effort. It at once becomes evident that the work of increasing alkaloids in a plant differs from that of increasing size, changing color or form. The investigator is dealing with unseen characters.

LITTLE HYBRIDIZATION DONE

Hybridizing drug plants has been attempted by several workers and under varying conditions but in general little result has been gotten from this method. There may be exceptions to this statement, such as cinchona;² but especially with plants of the temperate zone, the great majority of crossing experiments have resulted only in a chaotic jumble of characters without meaning. This is to be expected when we keep in mind the class of plants with which we are dealing.

The most serious effort then must be through selective methods, but here again certain difficulties at once arise. Since the characters with which we are working are unseen, the number of individuals that can be placed under observation is therefore limited, and in turn the chances of success are proportionately reduced.

In establishing a system of selection of belladonna³ (*Atropa Belladonna*) at the Mulford Drug Gardens, the effort was made to overcome this difficulty by establishing a correlation between some apparent physical character and alkaloidal content. If such a corre-

² The South American cinchona tree, from the bark of which quinine is secured, has been improved by breeders in Java, who have selected the best of many natural hybrids, and propagated them asexually. This is usually referred to as the only drug plant which has been improved through hybridizing; but so far as I am aware, there is no record of really scientific breeding having been done with it.

³ For an outline of some similar work with belladonna and other plants, see "Breeding Medicinal Plants," by F. A. Miller. *American Breeders' Magazine*, IV, pp. 193-201.

lation could be demonstrated, the advantage of observing thousands of individuals rather than hundreds would be at hand.

The breeding plot contained 500 individuals which were chosen from a lot of several thousand seedlings. The seed from which these plants were grown had been imported from Germany and no previous history of them was known. They were sown in the greenhouse in January and potted off in the usual manner. Those used for the breeding plot were chosen only because of uniform size and apparent vigor. Some of the features of the plant were recorded on a card at the time of setting out. These included size in its first and second weeks, and when adult; the blooming date, color, size of leaf and of root, and any other facts which seemed likely to be of interest. The plot contained five rows with 100 plants in each row numbered chronologically and recorded on individual cards. These plants were examined once each week for the first three weeks and then as often as the data on the cards required. The soil on which the plants grew was a heavy clay loam with a clay subsoil and had received no treatment except a heavy application of stable manure during the winter.

The leaves were gathered at the usual time—just as the flowers are opening—and enough leaves were allowed to remain to mature the fruit pods. The leaves were then air dried on drying racks in bundles corresponding to the plant from which they were taken, after which they were assayed for alkaloidal content. The error incident to this process was minimized by running the assays in duplicate. Of the 400 samples, 15 were discarded because too small, or because they were spoiled in assaying. The alkaloidal content of the remaining samples, expressed in percentages, was as follows:

Alkaloidal Content,	Number of Samples.
.0-.09.....	4
.1-.19.....	8
.2-.29.....	26
.3-.39.....	83
.4-.49.....	94
.5-.59.....	65
.6-.69.....	42
.7-.79.....	26
.8-.89.....	25
.9-.99.....	6
1.0-	6
	<hr/> 385

Mean = .507; σ = .194.

The standard of the United States Pharmacopeia is 0.4 atropine in belladonna, and the average sample found in the markets varies from this minimum to about 0.6. It is evident, then, that nearly 70 per cent. of the plants were above the standard in chemical content, and that six of them yielded 1 per cent. or more of atropine—a remarkably high percentage. They were as follows:

1.020
1.000
1.100
1.230
1.030
1.039
Avg. 1.07

Interest naturally centered on these plants, and a study of the records showed that every one of them was small at the time of harvest, while practically all the plants which yielded .01 or less were large and vigorous in growth. Furthermore, the six high plants all had light stems, while the plants yielding .1 or less had dark stems. These characters were the only ones found which seemed to give a clue to the chemical constitution of the plants, but they were marked enough to warrant especial attention during the coming season, when a selected second generation will be grown.

In conclusion, it must be remembered that this work covers only one season and hence must be regarded as merely preliminary. It is highly encouraging to us, however, in indicating the extreme variation of atropine content in the belladonna plant and giving hope that valuable commercial results can be secured by selection.

SOME CONSTITUENTS OF JAMBUL.¹

BY MERRILL C. HART AND FREDERICK W. HEYL.

The Jambul Tree (*Syzygium Jambolana*), well known to the natives of the East Indies and Malay regions from China to New South Wales, for its edible fruit, is a large tree belonging to the *Myrtaceae*, sometimes attaining the height of ninety feet. A careful gleaning of the medical literature finds that three parts, the seed,

¹ Reprinted from the Journal of the American Chemical Society, Vol. XXXVIII, No. 12, December, 1916.

pericarp and bark, have been employed in the treatment of *diabetes mellitus* with questionable results, but is perhaps impressed by some beneficent results reported. Two parts of the plant, the bark and the pericarp, have been recognized in the pharmacopeia of the Netherlands.²

The berry-like, sour fruit is about as large as the olive, and apparently forms a readily procurable commodity in the European market, whereas the term Jambul as used in this country refers to the flinty, hard seed contained in the pericarp. There is also some difference in opinion as to the part of the plant which should be employed in the manufacture of the fluid extract.

The early chemical studies showed the presence, in the bark, of tannin,³ in the seed, of gallic acid.⁴ The seed yields a trace of ethereal oil, 0.37 per cent. fat, and 0.3 per cent. resin, and pharmaceutical shrewdness, rather than chemical investigation, or conformance with a rational system of nomenclature, has given the name "antimellin" to an alleged glucosidic constituent.⁵ This finding of Börsch could not be substantiated by Power and Callan.⁶ The statement of Pottiez⁷ concerning the presence of quercitol and cinnamic acid could not be confirmed by these chemists. Stephenson⁸ found that the diastatic hydrolysis of starch was appreciably reduced by the presence of the extract of the fresh kernels.

Several preparations of German origin are marketed, *e. g.*, Djoeat, Bauers, Glykosolvol and Pavykol, which probably contain, in part, extracts from the bark or pericarps, and Djoeatin (Börsch) which is alleged to contain the above-mentioned "antimellin." The presence of tannin has recommended its use among the natives as an astringent, but on the whole, as stated in the Dispensatory, "it has failed to establish itself as a practical medicament."

The recent work of Power and Callan on Jambul seed leaves the question as to the pharmaceutical value of the pericarp. It was our plan to make a comparative study of the seed and pericarp, and we decided to investigate independently the seed, while awaiting a promised supply of pericarp, which unfortunately will not be available at present and we therefore report our work on the seed.

² *Ph. Nederl.*, IV.

³ Johanson, Dissert., Dorpat, 1891.

⁴ Elborne, *Pharm. J.*, 3, 932 (1888).

⁵ Börsch, *Pharm. Ztg.*, 44, 574 (1899).

⁶ *Pharm. J.*, 34, 414 (1912); 91, 245 (1913).

⁷ *Ann. Pharm. Louvain*, 5, 373, 490 (1899).

⁸ *Pharm. J.*, p. 211 (1892).

Our sample of Jambul seed, which was badly worm eaten, was received from Bombay. It was picked over and 91 pounds were rejected from a 200-pound shipment. The material contained 8.0 per cent. moisture and 2.9 per cent. ash. Ligroin extracted 1.2 per cent., ether, 1.3 per cent., and alcohol 16.1 per cent. The residue insoluble in alcohol had the following composition: crude fiber, 2.3 per cent.; pentosans, 2.1 per cent.; protein, 6.3 per cent.; starch, 41.4 per cent.; dextrin, 2.1 per cent. The alcohol extract showed the presence of 0.3 per cent. sucrose and 3.3 per cent. reducing sugars. Tannin amounted to 6.0 per cent.

The products present in the alcoholic percolate, and soluble in water, besides the sugars and tannin, are ellagic and gallic acids.

The study of the resin gave, in general, the same results as those reported by Power and Callan, *i. e.*, from the ligroin extract, oleic, linoleic, palmitic and stearic acids; from the ethyl acetate and alcoholic extracts, chiefly ellagic acid. We are, however, able to describe more fully the presence in the ligroin extract of myricyl alcohol, of a hydrocarbon very probably hentriacontane, and of a phytosterol, $C_{27}H_{46}O$, melting at $135-135.5^{\circ}$ that formed an acetate, melting at $119-120^{\circ}$. The ether extract as well as the chloroform extract yielded in addition a phytosterolin, $C_{33}H_{56}O_6$, which we have described in detail.

We endeavored to repeat Stephenson's work which would indicate the presence of something in Jambul that would retard diastatic hydrolysis. In using the iodine method of Sherman, Kendall and Clark,⁹ it was found to be impossible to read the end points of a diastatic hydrolysis because the presence of gallic acid in the extract decolorized the iodine solution. In the same way the reducing action of a Jambul extract is sufficiently great to render inaccurate their excellent gravimetric method employed for finding the activity of pancreatin.

EXPERIMENTAL.

(A) PROXIMATE ANALYSIS.—A sample of the air-dried seed after grinding and sieving was quantitatively extracted with various solvents, with the following results:

Extract	Percent.
Ligroin ($35-55^{\circ}$)	1.2
Volatile ether extract	0.2
Ether	1.3
Alcoholic	16.1

⁹ American Chemical Journal, 32, 1073 (1910).

The proximate analyses were conducted in accordance with the usual methods, and gave the result tabulated below:

	Percent.		Percent
Moisture	8.0	Protein	6.3
Starch (diastase)	41.4, 40.3	Ash	2.9
Crude fiber	2.3	Dextrin	2.1
Pentosans	2.1	Tannin ¹⁰	6.0

The quantitative examination of the alcohol-soluble carbohydrates resulted as follows:

100 g. of Jambul seeds were extracted with boiling 95 per cent. alcohol. The alcoholic extract was concentrated to a syrup, precipitated with a slight excess of lead subacetate and made to a volume of 200 Cc. The direct and invert readings at 22° in a 2 dcm. tube are —2.6V, and 3.2V, respectively. The invert reading at 86° in a 2 dcm. tube was 0.35V. Hence sucrose = 0.23 per cent., fructose = 2.3 per cent., and glucose = 2.1 per cent., respectively. Gravimetric determinations by the Walker-Munson process gave sucrose 0.33 per cent. and reducing sugar 3.3 per cent.

(B) EXAMINATION OF ALCOHOLIC EXTRACT.—For this purpose 45.4 kg. were exhausted by percolation with wood alcohol at room temperatures. Power and Callan extracted the seed with hot ethyl alcohol. The percolate (397 l.) was concentrated under diminished pressure to a volume of 12.5 liters. This concentrated extract on standing deposited 230 g. of yellowish material which was quite insoluble in the usual organic solvents. It could be redissolved in dilute alkali and then reprecipitated by the addition of acetic acid. After being digested with ether, and with ethyl acetate, this material was crystallized from pyridine. Brown needles were obtained that gave the characteristic tests for ellagic acid.

The filtered alcohol extract was poured into 25 l. of distilled water and vigorously agitated. After long standing the resin was removed by filtration. The aqueous alcohol filtrate was concentrated under reduced pressure in order to remove the alcohol. When this solution was diluted with distilled water, further precipitation took place even after diluting to a volume of 80 liters. The solution was allowed to stand overnight and the precipitate (372 g.) was filtered off. This material was of the nature of a phlobaphene. The filtrate was concentrated to a volume of 9.77 l. It now deposited 84 g. of ellagic acid. This deposit was digested with ether and

¹⁰ Both the Hide powder method, and the Proctor-Lowenthal method gave the same results.

with ethyl acetate and crystallized three times from pyridine. The crystals were washed successively with water, ethyl acetate and ether, dried at 150° and analyzed.

Calc. for $C_{14}H_6O_8$: C, 55.6; H, 2.0. Found: C, 55.6; H, 2.1.

The aqueous solution containing 5276 g. of water-soluble plant extractive was divided and a quantity containing 3750 g. was extracted repeatedly with large volumes of ether, which extracted 524 g. of a greenish white solid, which proved to be gallic acid. This amounts to 1.63 per cent. of the drug. A portion of this crude gallic acid was digested with fresh ether, which removed the color. The residue crystallized from water in colorless needles, decomposing at about 240° . It was dried at 115° and identified as gallic acid:

Calc. for $C_7H_6O_5$: C, 49.4; H, 3.5. Found: C, 49.4; H, 3.4.

The dark green ethereal filtrate from the purified gallic acid was exhaustively examined, and a small quantity of sulfur melting at $114-115^{\circ}$ was identified as a constituent.

The aqueous solution which had been completely extracted with ether, was now extracted with chloroform, which extracted only 3 g. of material. This was redissolved in chloroform and fractionally extracted with the usual alkaline solvents which yielded nothing definite. The neutral solution upon evaporation yielded a minute quantity of crystalline material melting at $115-121^{\circ}$. This gave the color tests of the phytosterol group.

The aqueous solution which had been completely extracted with ether and chloroform was now extracted repeatedly with hot amyl alcohol. During this extraction there ensued a gradual precipitation of ellagic acid. The material extracted with amyl alcohol weighed 742 g., equivalent to 2.2 per cent. of the drug. This extract contains a considerable quantity of ellagic acid. The amyl alcoholic extract could be prepared as a greyish white powder, by precipitation with petroleic ether. From dilute alcohol and from pyridine solutions, ellagic acid separated. A part (58 g.) of the amyl alcoholic extract was redissolved in this solvent and the solution was extracted with the usual alkaline solvents, but nothing crystalline was separated by this procedure. Another part (127 g.) was hydrolized by boiling for several hours in the presence of 5 per cent. sulfuric acid, but no crystalline hydrolytic products

were found. Eighty-four grams were hydrolized by boiling for one minute with 10 per cent. potassium hydroxide solution. The mixture was cooled and poured into an excess of dilute sulfuric acid, and then steam distilled. From the contents of the flask a quantity of gallic acid, melting at 240–242°, was isolated.

A quantity (171 g.) was boiled with a large volume of water and then vigorously steam distilled. Ellagic acid separated. The solution was concentrated and further quantities of ellagic acid separated. At length, after evaporation to dryness, the residue was boiled with ethyl acetate and some insoluble material (ellagic acid) was removed by filtration. It was impossible to obtain crystals from this solution. The ethyl acetate solution was evaporated to dryness, and again taken up in dry ethyl acetate, in which it was freely soluble, but nothing definite could be obtained from it. The amyl alcoholic extract is not glucosidic.

The aqueous liquid which had been extracted with ether, chloroform, and with amyl alcohol, was freed from the latter immiscible solvent by a vigorous steam distillation. The distribution of nitrogen in this solution was as follows: Total soluble nitrogen, 0.0649 per cent.; ammonia nitrogen, 0.0079 per cent.; lead subacetate precipitable nitrogen, 0.0197 per cent.

In order to test for acid amides, one fifth of the solution was precipitated with mercuric acetate solution, but the results were negative.

The remainder of the solution was precipitated with basic lead acetate, filtered, and the precipitate was found to consist essentially of lead tannate.

The filtrate from the lead tannate was freed from lead with hydrogen sulfide and sharply concentrated. Although this syrup yields a precipitate with phosphotungstic acid, no nitrogenous bases were isolated from this fraction. The only product found was sugar, a crystalline deposit of a *d*-phenylglucosazone melting at 207–208° being readily prepared. Pentose sugars were absent.

THE EXAMINATION OF THE RESIN.—The resin which precipitated when the alcoholic extract was poured into water weighed about 699 g., equivalent to 1.5 per cent. of the drug. It was dissolved in wood alcohol, poured upon purified sawdust, transferred to a continuous extractor, and extracted with the following results:

Ligroin (40-60°)	433 g.
Ether	20
Chloroform	13
Ethyl acetate	79
Alcohol	109
Total	<u>654 g.</u>

THE LIGROIN EXTRACT.—Three hundred grams were dissolved in ether and shaken with solutions of potassium hydroxide (5 per cent. and 10 per cent.). The alkaline extractions were acidified and extracted with ether. This ethereal solution was successfully extracted with a solution of ammonium carbonate (10 per cent.) but these extracts yielded nothing but a small quantity of smeary material precipitable with acid.

The ethereal solution was now extracted with solutions of potassium carbonate, and the fatty acids occurring free in the plant were removed. The alkaline extract containing the potassium salts of these fatty acids was acidified and extracted with ether. The ethereal solution of fatty acids was dried over anhydrous sodium sulfate. The ether was removed and a residue of about 92 g. obtained. This was distilled under diminished pressure. The boiling point was 215-250° at 20 mm., and the iodine number of the distilled acids which solidified in the receiving tube was found to be 88.7. A very considerable quantity of this material could not be distilled and it remained as a tar in the flask. These fatty acids were studied in connection with those obtained upon the subsequent hydrolysis of the glycerides.

The ether solution which had been extracted with ammonium carbonate and potassium carbonate was now extracted with a solution of potassium hydroxide. The alkaline extract was acidified and a quantity of tarry material (15 g.) precipitated. This was dissolved in alcohol and subjected to acid and alkaline hydrolysis, but nothing crystalline could be separated in either case.

The ether solution which had been extracted with solutions of ammonium carbonate, potassium carbonate and potassium hydroxide contained 17 g. of neutral material belonging to the unsaponifiable material. It boiled at 120-250° at 15 Mm., and yielded oily distillates exactly corresponding to those described among the unsaponifiable products of the fat.

The original ethereal solution of the fat which had been extracted with solutions of potassium hydroxide was evaporated to

dryness and the residue was saponified by boiling with 250 Cc. of 10 per cent. alcoholic potash for about five hours. The alcohol was removed and water added to completely precipitate the unsaponifiable material, which was extracted with ether.

EXAMINATION OF THE UNSAPONIFIABLE MATTER.—The dried solution was evaporated to dryness and the residue was an orange-colored oil amounting to 47 g. It was dissolved in absolute alcohol and upon standing 0.15 g. of material separated. The melting point was indefinite ($62-76^{\circ}$) and suggested, as stated by Power and Callan, a mixture of hydrocarbon and a higher alcohol. By means of the phthalic acid fusion, and subsequent extraction with sodium carbonate, a small quantity of a hydrocarbon melting at 61° was isolated. Three crystallizations from ethyl acetate raised this melting point to 63° . It separated in colorless leaflets and was perhaps impure hentriacontane.

Calc. for $C_{31}H_{64}$: C, 85.3; H, 14.7. Found: C, 85.1; H, 14.1.

A small quantity of a sodium salt of an acid phthalic ester was isolated and boiled with alcoholic potash. A product separated which had the melting point of myricyl alcohol, $82-84^{\circ}$. It crystallized from alcohol in leaflets, which softened at 82° and melted at 85° .

Calc. for $C_{30}H_{62}O$: C, 82.2; H, 14.1. Found: C, 81.7; H, 13.5.

The alcoholic solution from which the hydrocarbon and myricyl alcohol had separated yielded no further crystallizations even from concentrated solutions after the addition of small quantities of water. This residue was distilled under diminished pressure.

Fraction I (b. p. $120-160^{\circ}$ at 100 Mm.). This was a colorless, limpid oil with a fragrant odor. The weight was 11 g.

Fraction I (b. p. $120-160^{\circ}$ at 10 Mm.). This was a colorless, oil, less mobile than the first fraction, and of about the same weight. A systematic fractional distillation of I and II effected no separations.

Fraction III (b. p. $200-250^{\circ}$ at 10 Mm.). This was a thick viscid oil which partially solidified. It weighed about 5 g.

The fractions collected above 250° at 10 Mm. solidified in the receiver. The fraction boiling at $280-340^{\circ}$ at 10 Mm. was crystallized from ethyl acetate. The material melted at about 132° , but

softened somewhat lower. It was necessary to separate a small quantity of low-melting material ($70-75^{\circ}$) by a fractional crystallization and phytosterol then separated in glistening plates, melting sharply at $135-135.5^{\circ}$.

Calc. for $C_{27}H_{46}O \cdot H_2O : H_2O$, 4.5. Found: 5.6 per cent.

Calc. for $C_{27}H_{46}O$: C, 83.9; H, 11.9. Found: C, 83.8; H, 11.6.

0.1163 g. of the anhydrous phytosterol made up to 20 Cc. with chloroform showed a rotation of -0.489 in a 2 dcm. tube, whence $[\alpha]_D^{25} = -42.04^{\circ}$.

It yielded an acetyl derivative that separated from acetic anhydride in thin plates which melted at $119-120^{\circ}$.

EXAMINATION OF THE FATTY ACIDS.—The alkaline solution from which the unsaponifiable matter had been extracted with ether was acidified and the liberated fatty acids were extracted with ether. The ether solution was dried over anhydrous sodium sulfate, concentrated to a small volume and then largely diluted with ligroin which precipitated some tarry material. This was removed by filtration, and the solvent was distilled from the fatty acids. These boiled chiefly at $230-260^{\circ}$ at 15–20 Mm. A small fraction distilled at $260-280^{\circ}$ at 20 Mm. The weight of distilled acids was 30.1 g., and the iodine number was 98.3.

These acids were mixed with those which had been extracted with potassium carbonate solution. A portion weighing 22.5 g. was converted into the lead salts, which were treated with ether. The liquid acids obtained from the lead salts soluble in ether weighed 12.9 g. (57.3 per cent.). These boiled chiefly at $235-245^{\circ}$ at 32–34 Mm.

Calc. for $C_{18}H_{34}O_2$: C, 76.6; H, 12.1; iodine no., 90.1; for $C_{18}H_{32}O_2$: C, 77.1; H, 11.4; iodine no., 181.4. Found: C, 76.6, 76.7; H, 11.3, 11.55; iodine no., 131.7.

The liquid acids therefore consist of a mixture of oleic and linoleic acids.

The lead salts of the fatty acids, insoluble in ether, were decomposed with hydrochloric acid and the solid fatty acids separated in the usual manner. When dissolved in absolute alcohol with the object of separating any of the more insoluble acids by crystallization, it was found that the acids were very readily soluble and no satis-

factory crystallization could be obtained even from very concentrated solutions. The alcoholic solution was fractionally precipitated with an alcoholic solution of barium acetate. This yielded Fractions I and II. Fraction III was precipitated by the addition of water.

1. Melting at $51-53^{\circ}$. C, 75.8; H, 12.4; N. v., 204.3.

III. This fraction was an oil and gave entirely anomalous analytical data. Iodine no., 35.2, 34.7; neutralization value, 34.9; and saponification value, 140.2.

The solid acids are therefore a mixture of palmitic and stearic acids.

Calc. for $C_{16}H_{32}O_2$: C, 75.0; H, 12.5; N. v., 219.1. $C_{18}H_{36}O_2$: C, 76.1; H, 12.7; N. v., 197.5.

THE ETHER EXTRACT OF THE RESIN, which amounted to 20 g., contained a quantity (2 g.) of an insoluble white solid. This was filtered off. When this substance was dissolved in chloroform, in the presence of a few drops of acetic anhydride, and sulfuric acid was added, a play of colors resulted showing at first transient pink, then blue, and finally a beautiful green. It was crystallized several times from dilute pyridine, and then melted at $275-285^{\circ}$. It was a phytosterolin. After being dried to constant weight at 120° it was analyzed.

Calc. for $C_{25}H_{46}O_6$: C, 72.3; H, 10.2. Found: C, 72.3; H, 10.2.

A portion of this was converted into an acetate, which crystallized from dilute alcohol in colorless, glistening leaflets melting at $167-168^{\circ}$.

0.5036 g. of the anhydrous phytosterolin acetate, when made up to 20 Cc. with chloroform, showed a rotation of -1.21° in a 2 dcm. tube, whence $[\alpha]_D^{23} = -24.4$.

One gram of this phytosterolin was hydrolyzed according to the method outlined by Power and Salway.¹¹ It was dissolved in 60 Cc. of hot amyl alcohol and 20 Cc. of an aqueous 15 per cent. solution of hydrochloric acid added, together with sufficient ethyl alcohol to form a homogeneous liquid. After heating for three hours in a reflux apparatus, steam was passed through the mixture to re-

¹¹ *J. Chem. Soc.*, 103, 399 (1913).

move the amyl alcohol, and the contents of the flask then filtered. A solid substance was thus collected, which after several crystallizations from ethyl acetate, alcohol, and dilute alcohol, separated in glistening leaflets melting at 134–135°. The mother liquors from this crystallization contained a relatively large quantity of an oily resinous material which had evidently been formed from the phytosterol by too prolonged hydrolysis. The crystals gave the phytosterol color reaction.

0.0983 g. made up to 20 Cc. with chloroform had a rotation of 0.38° in a 2 dcm. tube, whence $[\alpha]_D^{25} = -38.8$.

Calc. for $C_{27}H_{46}O$: C, 83.9; H, 11.9. Found: C, 83.3; H, 11.3.

The acid aqueous liquid, from which the phytosterol had been separated by filtration, was exactly neutralized with sodium carbonate, evaporated to dryness, the residue digested with absolute alcohol, and the mixture filtered. On evaporating the alcoholic filtrate a small amount of syrupy residue was obtained, which reduced Fehling's solution, and yielded an osazone melting and decomposing at 212°. It was thus evident that the sugar was glucose.

Thus this phytosterolin is shown to be phytosterol-*d*-glucoside.

The ether extract from which the phytosterolin had been separated was fractionally extracted with varying strengths of alkali. The potassium hydroxide extracts removed practically all the dissolved matter as a green oil which after some time became semi-solid. This could not be crystallized and was unchanged when boiled for several hours in the presence of an alcoholic solution of 5 per cent. sulfuric acid solution.

THE CHLOROFORM EXTRACT OF THE RESIN weighed 13 g. Part of this extract was quite insoluble in ethyl acetate and alcohol with which it was digested. This part was crystallized twice from dilute pyridine and melted at 280–295°. This gave the usual color test for a phytosterolin. After crystallization it weighed 3 g. Altogether the phytosterolin isolated from the ether and chloroform extracts amounted to 5 g. or 0.011 per cent. of the air-dried drug.

The filtrate from the above phytosterolin was evaporated to dryness, taken up in chloroform, and then fractionally extracted with varying strengths of alkali. Nothing of a crystalline nature was obtained by this procedure.

THE ETHYL ACETATE EXTRACT OF THE RESIN was a mixture of ellagic acid and tannin-like substances. Upon distilling off a por-

tion of the ethyl acetate about half of it separated as crude ellagic acid, which when crystallized once from alcohol yielded 13 g. of pure acid that did not melt at 350°. The mother liquor from this separation was a smear, that colored ferric chloride solution black, and precipitated a gelatin solution.

The part soluble in ethyl acetate was thoroughly examined but nothing was isolated.

THE ALCOHOLIC EXTRACT OF THE RESIN yielded 15 g. further of ellagic acid. The total ellagic acid separated amounts to 1.2 per cent. of the plant. Neither an acid hydrolysis nor a potash fusion gave any interesting decomposition products. Neither the ethyl acetate fraction nor the alcoholic extract was glucosidic.

KALAMAZOO, MICH.

METHODS OF STUDYING COAL¹

HOW A NEW METHOD OF REFINED TECHNIQUE HAS REVEALED PLANT RECORDS TO THE INVESTIGATION, ESPECIALLY WITH REFERENCE TO THE ORIGIN OF COAL.

BY E. C. JEFFREY.

Coal, since it is a mineral, has in the past been investigated with the aid of the admirable technical processes, which have been devised by the mineralogist and petrologist in the study of minerals and rocks. Fossil plants, also, have naturally been regarded as minerals, since in the condition ordinarily studied structurally they are petrified: that is, infiltrated or, in some instances, actually replaced by mineral substances. In addition to the relatively scanty petrified remains of fossil plants, which have previously been the most important document for the student of extinct vegetations, there are huge quantities of plants of former epochs, preserved for us by a more or less complete process of carbonization. This carbonization is so marked in some instances, that it is obvious that the plant remains have been charred previous to fossilization. The present writer has turned his attention to the utilization of these carbonized remains, in connection with the tracing of the all too incomplete geological records of plants. By the perfecting of processes

¹ Reprinted from *Science Conspectus*, Vol. 6, No. 3, 1916.

of softening and bleaching these carbonized remains, it has been found possible to add very largely to our knowledge of the organization of ancient plants, particularly of the Mesozoic Age, concerning which our information has been most meager. Methods developed first for the investigation of isolated members and parts of plants, by modification have proved serviceable in the study of that structurally almost unknown mineral coal. Our ignorance of the organization of coal is not due at all to the neglect of mineralogists, but rather to the unsuitability of the approved methods of their science in the case of a substance at once so opaque and so friable. The advantages of the methods recorded here may be judged from the fact that they permit the cutting of large quantities of sections, which average one tenth of the thickness of the few and laboriously secured preparations resulting from the grinding processes of the mineralogist. Moreover it is possible to render the sections even more favorable for study for bleaching, which is inapplicable to ground sections. It should be added that the successful manipulation of the processes described in the subsequent paragraphs involves a considerable experience in the use of the microtome, the slicing mechanism of the biologist.

The more recent and less modified coals are treated for sectioning with comparative ease. Alcohol alone is frequently sufficient to bring about the necessary degree of softening for successful slicing. Such coals are of relatively light hue, and sections need not be so thin as is essential in the case of the older and more highly carbonized coals. In general, however, somewhat vigorous softening agents must be used in the investigation of combustible minerals, since pressure and temperature have often brought about a considerable degree of modification even in coals of tertiary and secondary origin. Caustic soda or potash dissolved in alcohol of about 70 per cent. strength in the proportion one part in ten is a very useful preliminary reagent but has been found for various reasons, less valuable in use than phenol. This substance has unfortunately advanced immeasurably in cost on account of its employment as a basis for the manufacture of high explosives in the present European war. The phenol or carbolic acid is melted and the selected coal samples (which must ordinarily not be more than a centimeter in length and breadth by half a centimeter in thickness vertically) are subjected to its action. The material is to be kept hot in a water bath for a number of days, usually as long as a week. The

carbolic acid is then washed out with repeated changes of warm water. Heat and subsequent treatment with water after neutralization by means of an acid are likewise necessary in the case of material treated with alkaline alcohol, as described above. The advantages of the use of phenol in softening coal are that less swelling and cracking results than in the case of alkaline alcohol, and the material is in better condition for subsequent manipulations.

The removal of mineral substances from the coal is the next stage and for this purpose hydrofluoric acid is most generally employed. The fragments of coal remain in strongest commercial hydrofluoric acid for some days or even a week or more. In the case of coals neither much carbonized nor possessing a very high proportion of ash, the processes indicated suffice. In most coals, particularly those of the Paleozoic period, after treatment with hydrofluoric acid, the combustibles must be washed for a day or two in running water and then returned to the phenol for a renewed sojourn in the heat. This second softening in many cases is sufficient, but where a higher degree of carbonization is present, a second treatment with hydrofluoric acid is needed. In still more resistant coals the processes must be further repeated and the acid is reinforced in its action by adding crystals of chlorate of potash or soda, which brings into play the activity of nascent chlorine. With anthracites and other coals of an extreme degree of carbonization, nitric acid may be added with advantage to the hydrofluoric acid and chlorate of potash, but in moderation so that maceration may not result. The treatment with hydrofluoric acid and accompanying reagents, where these are necessary in the case of more refractory coals, is carried on in wax bottles or in glass bottles coated both externally and internally, with hard paraffine or beeswax. A fume-cupboard with heavily painted windows is safe and convenient for this work, particularly if it is built over a soapstone sink.

After the coal is softened and bleached (as is the case where chlorates and *aqua regia* are used), it is carefully washed in running water until quite free from the reagents. In the case of highly bituminous coals, particularly cannels and the like, the pieces may be returned to melted phenol for some days. With most coals, especially those of later geological ages, it is necessary to wrap the specimens with bands of cotton fabric, held in place by stout linen thread. This precaution prevents the coal from going to pieces in the phenol. After the last treatment with carbolic acid, the combustible is washed

repeatedly with warm water and then transferred to strong alcohol and finally to absolute alcohol, to remove all the water. Two or three changes of absolute alcohol are necessary. After the water is entirely removed the specimens are exhausted of all air under an air pump of high vacuum. In order to secure slices of the softened coal, it must be held together by means of nitrocelluloses. The best and least explosive of these is Schering's Celloidin, which is for the moment practically unobtainable on account of the war. It may be replaced with some degree of success by Anthony's photographic cotton. This is a less pure nitrocellulose and gives results which are less satisfactory. The dehydrated and air-free coal is transferred into a 2 per cent. solution of nitrocellulose in absolute alcohol and ordinary ether (of good quality). Absolute methyl alcohol gives better results than ethyl alcohol and is sold by the Bausch & Lomb Optical Company under the commercial name of Synthol. The material is secured in a strong bottle by means of a good cork wired in and remains for a day in a bath kept at the temperature of 70° Centigrade. It is allowed to cool and then transferred to a 4 per cent. solution of nitrocellulose in the medium indicated above. A second twenty-four hours in the heat brings it to a 6 per cent. solution. After the latter treatment it is enclosed in an air-tight chamber made from large diameter steam pipe. The corks are removed from the bottles preliminarily and by means of a valve in the cap of the chamber and an automobile pump, pressure is raised to two hundred or more pounds. The coal remains under these conditions over night and has then become thoroughly infiltrated with the solution of nitrocellulose. The next step is to transfer it to a thick solution of nitrocellulose. In this it is placed again in the warm bath and after a time still further thickening is brought about by the addition of dry fragments of nitrocellulose. After several days of repeated thickening the specimens are now ready for the final process. This consists of transferring them from the thick nitrocellulose to chloroform. Chloroform has the valuable property of at once hardening the nitrocellulose and further softening the coal. After a stay of some hours in chloroform, which must not be used sparingly, the piece of coal are transferred to a mixture of equal parts of alcohol and glycerine, where they may remain indefinitely, until needed for sectioning.

The fragments of coal treated in the manner described above are clamped in a heavy sliding microtome (the Jung-Thoma modified to the author's design answers very well for this purpose). A very

sharp and heavy knife is employed for sectioning and its edge must be kept moistened with ordinary strong alcohol. The sections are turned back on the knife, as they are sliced, by means of a large camel's hair brush, wet with alcohol. Successful sections must usually be five micromillimeters or thinner. If the processes have been successfully carried out, abundant and consecutive slices can easily be secured, showing every feature of organization of the coal.

After the sections are cut they are dehydrated by means of absolute alcohol, to which a quantity of chloroform has been added to obviate the softening of the nitrocellulose in the coal. From the absolute alcohol and chloroform they are transferred to benzole or some other clearing medium and are then mounted in hard Canada balsam, dissolved in benzole or whatever clearing agent has been used on the sections. Where too high a degree of clearing is undesirable, as for example in the case of oil shales, chloroform may with advantage replace benzole or xylol. After the covers are put on, the preparations are allowed to dry for a day in a horizontal position and they are gradually warmed up with lead weights on the covers to promote flattening. When the balsam has become so thickened by the heat as to set in the cold, the slides are cleaned up. Where it is necessary to make photomicrograms of them, they are still further flattened by means of a clip clothes pin acting on a disk of cork (over the cover) in the heat of a warm bath. For photographic reproduction, the best lenses (Zeiss apochromatics) are desirable and these should be used with a yellow screen and chromatic plates. Screens of other colors, although theoretically more desirable than yellow, have not been found practically to give as good results, probably on account of the difference between the visual and chemical focus even in the best microscopic lenses. The largest possible amount of light should be used, an end to be attained both by having a powerful electric arc as a source of illumination and the diaphragm of the sub-stage condensor opened to the widest possible degree, consistent with sharp focusing of the object. Naturally only the very best lenses will give good results under these conditions. The details of photomicrography are so familiar to all scientific workers in the field here described, that further details will only add unduly to the length of this article.

In conclusion are added, at the editor's request, some statements in regard to the bearing of the results obtained by the technical manipulations described upon the problem of the mode of formation of coal. It is to be noted that the mass of expert opinion at the

present time regards coal as of the nature of modified peat and as having originated in most cases on wet land as the result of the rooting, flourishing and falling of successive generations of plants on the prostrate remains of their ancestors. This condition is realized in the cold, temperate regions of our earth. In the tropics, however, in spite of a luxuriance of vegetation, with which that of the greatest coal age (Carboniferous) has been frequently compared, there are no accumulations of vegetable matter on the soil. In warm climates the hoarding of plant remains occurs only in the bottoms of lakes and tranquil estuaries, since the high temperature makes the destruction of dead vegetable matter on land particularly rapid. Even in this country, which, as a whole, is neither particularly hot nor especially cold, we have the authority of the United States Bureau of Mines (Peat Investigations) for the statement that by far the greater accumulations of vegetable matter occur under open water, which by its relatively constant level, safeguards the hoardings in its depths from the ravages of destroying fungi, since these are unable to flourish subaqueously.

The investigation of coals from all parts of the world and from every geological age, by the methods described in the earlier paragraphs, has made it clear that, in general, coal is of the nature of impure cannel. It is universally conceded that cannel coals, oil shales and similar combustibles, which constitute a small proportion of coals mined, were laid down in open water. We can best picture their mode of deposition by reference to a lake of to-day. Generally in the month of June the forest trees shed their fertilizing dust (pollen) in the air, to be borne by the winds to the waiting seeds. Most of the blossom dust is spilled, however, on the bosoms of lakes, lying in sheltered hollows, where the air currents losing their driving force drop their load of pollen, which falls on the waters as so-called "sulphur showers." After floating for a while in circling windrows, the pollen sinks with other coarser vegetable matter into the depths of the lake or estuary. Where the pollen or spores were relatively abundant in the depths of the coal lakes of the past the result was a deposit which later became a cannel or oil shale. In more troubled and shallower waters a greater amount of the vegetative parts of plants accumulated with the spores and pollen, to constitute the raw material of a "fat" bituminous coal. Where the vegetative parts predominated a "lean" type of coal is the final result. Often in addition to spores we find in coal wood with structure preserved, most inappropriately designated "Mother of Coal."

This constituent, which is the record of ancient forest fires, frequently retains its organization so perfectly that it is possible to diagnose the type of tree from which it was derived. If the wood was only partially charred by the action of heat, its persistence as such in coal is correspondingly incomplete. Sections of coal ordinarily reveal two sorts of material showing recognizable structure: namely, "Mother of Coal" (relatively rare) and spores or pollen of the higher or vascular plants (more or less abundant). In addition to these structurally preserved constituents, combustible minerals are largely formed of a brown matrix resulting from the modification in the course of ages of the uncharred woody and other gross vegetable remains. With the fundamental brown of highly modified wood, the spores contrast by their golden yellow hue and "Mother of Coal" by its intense black (shading into brown in those portions incompletely charred). The mass of the coal has been subjected to enormous compression during the ages elapsed since its deposition in the bottom of the waters. As a consequence even its structural constituents are greatly flattened in the plane of the horizontal bedding or laminaion.

The study of ultimate organization now rendered possible by improved technique appears to finally set at rest the controversy which has lasted for nearly a century and a half, in regard to the origin of combustible minerals. The generally accepted view of the way in which coal has been formed is that it is essentially, dynamically and chemically transformed peat. This conception which took its origin with von Beroldingen in the eighteenth century, has had its main defenders in Germany and as a result of the Teutonic scientific hegemony in modern times has been widely adopted in all parts of the world. In contrast to this hypothesis is the more logical view, cherished mainly in France, that coal is the consequence of organic sedimentation in open water. This opinion has been ably defended by Renault, Grand'Eury and many others, and there appears now no doubt that it is the correct one, since all the data derived from the microscopic study of coal, which must apparently ever be most cogent, are entirely in its favor. We must accordingly regard the hoardings of past plant life, preserved for us in the form of the various coals and their products, petroleum and natural gas, as having accumulated not in peat bogs but at the bottom of tranquil lakes, not *in situ*, but as the result of water transports.

CORRESPONDENCE.

REPRESENTATION OF PHARMACY ON THE COUNCIL FOR NATIONAL DEFENCE.

Dear Brother Pharmacists:

Notwithstanding that this communication is printed, it is important to every pharmacist and to the country-at-large, and the only reason for sending you the matter in this way is on account of the haste that is necessary in order to do effective work.

The letter herewith is taken from one by President F. J. Wulling, of the American Pharmaceutical Association, addressed to the Secretary of War. It explains itself and no further comment is necessary in that respect. The short letter is one that was dictated to a Senator and will serve as a guide for writing to your Senators and Congressmen, and the other one will serve for the substance of a letter to the Secretary of War. As he has already been apprised of the pharmacists' desire, you can be very brief in your communication, but let your letter inform him of the object you have in addressing him.

The writer is certain that your Association will favor the effort which the American Pharmaceutical Association is making, and therefore either the secretary or president alone or the executive committee should be in position to at once address the Secretary of War and Senators and Congressmen. Quick work is the important thing and we hope that you will give this matter your very prompt attention. Let them know the strength of your organization, and if advisable, the number of druggists in your state.

May we say in this connection that the American Pharmaceutical Association is alive to the interests of American pharmacy and is only handicapped because of insufficient members. Let us therefore urge that at your forthcoming meeting you make the strongest effort possible to persuade as many to join the Association as possible. We believe that it is a duty of all pharmacists to belong to the American Pharmaceutical Association, and then they receive the benefits that this Association offers in its *Year Book* and *Journal*. The American Pharmaceutical Association has done great work in behalf of pharmacy. Its *Proceedings*, the *Year Book*, the *Journal*, the *Pharmacopœia*, the *National Formulary*, the work of the Drug Trade Conference speak only in part of this.

At this time the object of the communication is centered to enlist your support in securing due recognition for pharmacists in the government service and particularly apprise the government officials that pharmacists can be of efficient and valuable service. Your prompt coöperation will therefore be appreciated.

Thanking you and with fraternal greetings,

THE JOURNAL OF THE A. PH. A.

E. G. EBERLE,

Editor.

It appears that pharmacy has no adequate representation in the Army and Navy and that no representation has been accorded it on the Council for National Defense. Medicine is strongly represented. Medicine is not pharmacy, nor does it include pharmacy, as evidenced by the existence of the separate pharmaceutical profession. National defense without adequate pharmaceutical representation and recognition can never be as effective as it can be with pharmaceutical participation under proper standard of recognition. Medical men are not pharmacists and, as far as I know, do not claim to be. They cannot any more give expert pharmaceutical service than pharmacists can give medical or surgical service. In the failure to recognize and employ the expert pharmaceutical services available, the country falls short in that degree, as I see it. It is fallacious to claim that pharmaceutical service in war or peace is negligible or of so low a grade that it shall be a hand-maiden to any other division of the service.

The Council for National Defense has appointed a committee of which the Secretary of War is chairman, to effect, among other things, a practical standardization of pharmaceutical supplies. Who is as competent as a highly trained expert pharmacist to direct this standardization and other purely pharmaceutical activities? Unless this kind of work is under the direction or responsible participation of such a pharmacist, the country is deprived of the best kind of service in this field and yet it is entitled to the very best that the country affords. This kind of expert service is freely at hand and available and, as president of the American Pharmaceutical Association, I respectfully request and urge that it be employed. I feel that if I did not make this request and make it with the fullest strength of whatever influence my office carries, I would not be doing my duty to my country, not to speak of my duty to my calling.

It should be considered that in a crisis such as the United States finds itself in at the present time it is unwise for the country to risk the possible displeasure of so large a part of the representative citizens as pharmacists constitute. There are probably in excess of 500,000 persons engaged in pharmaceutical activities. These are represented in a large measure by a number of strong national and state associations—among them the American Pharmaceutical Association, the National Association of Retail Druggists, the American Conference of Pharmaceutical Faculties, the National Wholesale Druggists' Association, the American Drug Manufacturers' Association, American Association of Pharmaceutical Chemists, National Drug Clerks' Association, the Drug Trade Conference, *the several state associations* and others. The good will in the fullest measure of all these is essential. I do not maintain that these interests would withhold their good will if not given deserved recognition and the opportunity to serve in their fullest capacity, but I do maintain that proper recognition would greatly stimulate and augment their help and loyal support.

I desire to further direct attention to the unfortunate fact that the United States has not a pharmaceutical corps for the control and direction of medical and pharmaceutical supplies service such as all other great countries, except Great Britain and Russia, have. In each of these large countries a corps of highly trained pharmacists with commissioned rank has the medical and pharmaceutical supplies service in its hands. The head of the service in Germany is of the rank of Colonel; in Japan, of the rank of Lieutenant-Colonel; in Italy and France, of the rank of Major-General. These officers are experienced pharmaceutical chemists of high attainments and qualifications, capable of directing their respective service. Our own country contains many such men who are at least as capable, if not more so, for this kind of service as a surgeon could possibly be. That American pharmacy is not represented in the country's service in the form of a pharmaceutical corps composed of men equal in rank to those in the medical service is undoubtedly due to the fact that American pharmacy has not exerted that pressure for this merited recognition and opportunity to serve under its own responsibility and standard that it is capable of. Much dissatisfaction in this respect on the part of representative pharmacists in all divisions of the calling has been reported to me recently. It is my opinion that the country cannot afford to continue to ignore American pharmacy as it has done in the past.

In my humble opinion, if the post of Chief Medical Purveyor is not already in existence, it ought to be created and put in charge of an expert pharmaceutical chemist of administrative ability. Such a one should be clothed with ample authority and should be of the rank not lower than that of Colonel. The importance of the medical and pharmaceutical supplies service can hardly be exaggerated. The Hospital Steward of the present should not be confounded with the highly trained pharmaceutical chemist of administrative capacity I have in mind. Our late war with Spain demonstrated the utter inadequacy and futility of methods then in use for the purchase, manufacture and distribution of pharmaceutical and medical supplies.

In writing thus I know that I am representing American pharmacy at large, but of course I have only the authority vested in the office I hold to speak for the American Pharmaceutical Association.

I mean no disrespect to anyone. What I have said and urged grows out of my loyalty to the country and the cause it is championing and to our calling.

My urgent suggestion is that every national and state association appoint forthwith with the greatest dispatch strong and capable representatives to constitute a Council or Commission to bring about deserved and adequate pharmaceutical representation in the Army and Navy and on the Council for National Defense. This isn't the time for futile and undirected talk and discussion but for determined, insistent and fruitful action. *This is the psychological moment.*

A LETTER TO CONGRESSMEN AND SENATORS.

(This letter was written by a pharmacist and may be used as a guide.)

As you know, American pharmacy feels that it has not proper representation and recognition in the government service. It has just come to my attention that the Council for National Defense has appointed a committee to effect, among other things, a practical standardization of pharmaceutical and medical supplies. The Secretary of War is chairman of that committee. It appears that no pharmacist is on the committee. For that reason I have written the Secretary of War in the matter. American pharmacists cannot understand why the government treats pharmacy so shabbily and medicine so generously. Here is an opportunity for someone to right a wrong and to earn the everlasting appreciation and thanks of pharmacy.

I do not want to take too much of your time, but in case you

would care to have me do so I will be very glad to take the matter up further with you and go into details.

PHARMACEUTICAL CORPS IN THE U. S. ARMY.

PHILADELPHIA, May 11, 1917.

Hon. Nelson D. Baker,
Secretary of War,
Washington, D. C.

Dear Mr. Secretary:

The Board of Directors of the Philadelphia Drug Exchange earnestly urges the establishment of a Pharmaceutical Corps in the U. S. Army analogous to the Medical Corps, the Dental Corps and the Veterinary Corps, for the following reasons:

1. The present system of enlisting pharmacists in the Army, *not* as pharmacists, but as privates, is hopelessly antiquated. France, Germany, Japan and other foreign countries have a Pharmaceutical Corps in their armies in charge of a pharmaceutical expert.

2. The present system is unjust to pharmacy and pharmacists. Pharmacy is a profession and the pharmacist of to-day has had years of collegiate training and practical experience in scientific work. To enlist professional men as privates is not only unjust to the men, but is unjust to the Army, because it denies to the Army the possibilities of service which such men could render.

3. The present system is faulty. The status of pharmacists in the Army is very unsatisfactory. Officially, they are not pharmacists, but non-commissioned officers with responsible duties and no possibility of advancement in the Service as pharmacists. They can excel as privates and be promoted as privates, but they cannot excel as pharmacists and be promoted as pharmacists; and this injures the service.

4. The present service is detrimental to the efficiency of the Army itself, because it fails to recognize the importance of proper and sufficient pharmaceutical service and denies to the sick and wounded the best pharmaceutical service that the Nation can give.

5. The present system is unfair to the medical corps, because it denies that body the assistance and support that a properly trained pharmaceutical corps could give. The pharmaceutical service could be made most valuable to the medical profession, not only in the hospitals, but also in the field.

Pharmacists have been trained, not only in the science and art of pharmacy, but also have had elementary instruction in some of the medical sciences, and with but little extra training could be made useful "medical assistants" in the field in the matter of surgical anesthesia, surgical dressing, etc., thus supplementing and helping the medical service.

We are informed by the Dean of a medical school in Philadelphia that 14,000 physicians will be required for an army of a million, that there are less than 7,000 physicians with ages of less than 31, and that, of these, probably one-half are physically unfit for service.

If this is correct, then only one fourth of the necessary medical material is available. In view of such a possibility, it seems to us that pharmacists could be made, with extra training, most valuable "medical assistants" in the field, while in the hospitals they could be given charge of the medical supplies of the hospitals, and render pharmaceutical and chemical service in the compounding and dispensing of drugs and in the chemical and bacteriological examination of excrements, foods, water, milk, etc.

Again urging the establishment of a Pharmaceutical Corps in the Army as most essential for proper pharmaceutical service, we remain

Yours respectfully,

(Sgd.) JOHN FERGUSSON,
President.

(Sgd.) J. W. ENGLAND,
Secretary.

QUARTERLY REVIEW ON THE ADVANCES IN PHARMACY.

BY JOHN K. THUM, PH.G., GERMAN HOSPITAL, PHILADELPHIA, PA.

POTASH.—According to Commerce Reports, a company making Portland cement at Durham, Ont., is now turning out as a by-product from the feldspar used, from twelve to sixteen tons of potash daily. Chlorides and caustic products are produced, the former being said to be an almost pure product. It is said that even the dust and

gases of the plant are trapped, in which there is said to be five per cent. of potash, which is used for fertilizer. It is also said to be quite possible for every cement plant in Canada, within the next five years, to produce potash in large quantities as a by-product. As is well known, there are immense deposits of feldspar in Canada, which are said to contain at least ten per cent. of potash, of which 86 per cent. in a pure form is collected. And it is also stated, and this is most important, the cost of manufacture is less than the freight charge per ton on that heretofore coming from Germany (*Jour. A. M. A.*, March 24, 1917, p. 917).

ANTIDRUG BILL.—The bill known as the Whitney antinarcotic act was endorsed by representatives of the New York State and New York County Medical societies and of the Medical Economic League at a hearing, March 22. This bill provides for a free supply of drugs for addicts and for the registration of addicts. Some of those present offered objection to the triplicate order blank system of checking narcotic drug distribution. However, this part of the proposed bill is under consideration with a view to formulating some plan which will not work undue hardship on practicing druggists (*Jour. A. M. A.*, March 31, 1917, p. 987).

PATENT LEGISLATION.—At the January meeting of the Philadelphia Branch of the American Pharmaceutical Association two interesting papers on the fore-mentioned subject were read. The subject is a timely one and one that affects the great mass of people very closely; this point should be played upon very insistently so as to get Congress to act. Never has the time been so favorable for legislation of this character. In the first paper Mr. J. W. England mentions that the crux of the situation in connection with the patenting of chemicals in this country is the system of permitting *product-protection*; he then goes on in a convincing manner and points out how this impedes the progress and development of American chemical industry. Dr. F. E. Stewart in his paper gives a most comprehensive discussion of the Paige Bill. This paper is enlightening in many ways and should be read by all chemists and pharmacists (*Jour. A. Ph. A.*, Feb., 1917, pp. 120 and 122).

PHARMACOLOGY OF THE ACONITES.—Of the vast number of the *Aconitum*, and there are at least 150, only two or three have been examined pharmacologically. Notwithstanding the fact that all those examined show the same characteristic results on the nervous system, secretions, circulation, and respiration, yet they may be

divided into two classes. One of those examined acts principally on the circulation, and the other on the respiration. Those containing aconitine belong to the first class, and those which contain pseudo-aconitine belong in the other class. *Aconitum Napellus* is the most efficient of the aconitine class. To the other class belong *Aconitum heterophylloides* and *Aconitum magarum*; these can be conveniently referred to as the pseudo-aconitine group. (*Jour. Pharmacology*, Chem. Abstr., 1917, II, 70, T. R. Fraser).

ELIMINATION OF STRYCHNINE BY THE KIDNEYS.—According to the researches of the investigators named below this alkaloid makes its appearance in small quantities in the urine within a few minutes of administration, and the amount excreted is very much increased by diuresis. Injected intravenously large doses of the alkaloid do not increase the amount of excretion. It was found that in the case of dogs, renal excretion is not sufficient to save life, no matter how active it may be. It is therefore logical to assume that diuresis helps very little to the successful treatment of strychnine poisoning. It was also discovered that the amount of strychnine eliminated by the kidneys by dogs agrees generally with the amount eliminated in the same way by man (R. A. Hatcher and M. J. Smith, *Jour. Pharmacology*, Chem. Abstr., 1917, II, 69).

BANANA STALKS AS A SOURCE OF POTASH.—The continued high prices for potash and the constant demand for it, for use as a fertilizer, has caused attention to be directed to many vegetable sources of this alkali. These sources have hitherto been disregarded as a means of potash production, but since the Stassfurt mines are no longer accessible, the world has been sad put for this very necessary adjunct to agriculture, and industry in general. Among the many sources mentioned banana stalks seem to show much promise. A recent investigation shows that banana stalks contain as much potash as, or nearly as much as, dried kelp as a filler for commercial fertilizers. The stalks, when charred and lixiviated, will produce 27 pounds from one ton of stalks, containing at least 90 per cent. of K_2CO_3 . Further investigation may reveal more possibilities (*J. Ind. Eng. Chem.*, 153, 1917).

DESTRUCTION OF FLY LARVÆ IN MANURE.—No doubt the logical way to get rid of the ubiquitous fly is to destroy him before he reaches his full development. Therefore the results of the U. S. Department of Agriculture's experiments as to the best way in which to destroy the larvæ, should be of interest. After three

seasons the department feels safe in saying that one of the most efficient substances for this purpose is borax. Two pounds of this chemical to 28 gallons of water, which should be sufficient for 24 bushels of manure, is the most effective and cheapest of all the many substances tried. However, it must be used with a great deal of care, for if the manure is to be used for fertilizing purposes an excessive amount of the borax will be very prone to have an injurious effect on growing plants. They also found that 8 ounces of green hellebore to 10 gallons of water for the treatment of 8 bushels of manure, is also effective. Of course the cost is somewhat higher. Calcium cyanamide was also found to be of value for this purpose, a half pound of it to each bushel being the proper proportions. While the cost of this is higher, the manurial value is considerably increased; it is as well to add to it then at least half a pound of superphosphate as this chemical prevents the loss of ammonia by the action of the cyanamide, and in turn this adds to the increase of the phosphorus content. Good results were also obtained with solutions of aniline and emulsions of nitrobenzene with fish oil soap, this being found to be without harm to the fertilizing value of the manure. They advise against the use of such potent substances as potassium cyanide, Paris green, arsenic sheep-dip, and pyridine, it being claimed that these substances are too dangerous (F. C. Cook and R. H. Hutchinson in U. S. Depart. Agric. Bullet., 408).

YELLOW SOFT PARAFFIN AS AN INTESTINAL LUBRICANT.—There is considerable objection being manifested against the use of the liquid paraffin for internal consumption because of leakage; despite this disagreeable feature the popularity of this kind of treatment for habitual constipation is growing more and more every day. It is proposed by the writer that the soft paraffin be used to overcome this tendency of leakage; it is claimed that it is more thoroughly mixed with the intestinal contents and for this reason is more thoroughly lubricating. The author feels that it is greatly to be preferred to any form of oily enema (H. Gifford, *Jour. A. M. A.*, 304, 1917).

CHLORAZENE.—This article, made in this country, has antiseptic qualities and the claim is also made that it is an active germicide. Its action is somewhat similar to the hypochlorites, but is less irritating. Chemically it is known as sodium para-toluene sulphochloramine. It appears as a white crystalline powder, and has a chlorine odor. Chlorazene is not intended for internal administration; ex-

ternally it is used in solutions varying from 0.5 to 4 per cent. in strength. It can be dried at or exposed to a temperature of 100° to 102° C. without decomposition taking place.

TOXIC EFFECT OF EMETINE HYDROCHLORIDE.—Two American Army physicians in a study of 140 cases of endometric dysentery treated with this drug, show that it is well to watch patients very closely who are being treated with emetine. They state that the danger is somewhat similar to that of salvarsan in the treatment of syphilis. Two of the patients died from conditions in no way connected with the disease for which they were being treated, while five others showed unusual symptoms, which, in the absence of any other known causes, were naturally attributed to the emetine. In the two fatal cases there was the inability to swallow water after food had reached the gullet; the heart was rapid and uncontrolled; there was a marked tendency for the head to fall forward, and there was a lobar-pneumonia. In the five other cases the symptoms were similar, all of which disappeared when the treatment ceased (Military Surgeon, 40, 58, 1917, Johnson & Murphy).

INFUSION OF BROOM TOPS AS A LARVICIDE.—A cold infusion made by steeping fresh crushed tops in water for from ten to twelve days, in a quantity sufficient to give to the liquor a greenish color, was found to be a quite formidable agent of destruction for caterpillars. It was found to be of great benefit for watering cabbage as it readily destroyed the larvæ of the cabbage butterfly and other numerous larvæ which feed on cruciferous plants. In France it has been found to be particularly valuable for removing *Cochylis* larvæ from vines and various caterpillars from apple trees. The infusion is applied by simply spraying or watering over the plants (*Rev. Sci., L'Union pharm.*, through *The Phar. Jour. & Pharmacist*, 2, 1917, 17, p. 139).

NEW METHOD FOR DETERMINING OZONE.—It is said that the following method for determining the presence of ozone used for surgical and therapeutic purposes is simple, accurate, and sensitive. This determination depends on the extreme avidity of ferrous ammonium sulphate for ozone, a reagent which is quite stable towards ordinary atmospheric oxygen under the conditions of the test. The reagent consists of 3.92 grams of ferrous ammonium sulphate dissolved in water and 20 mls of pure H_2SO_4 , sp. gr. 1.815, made up to one liter. This is quite permanent under ordinary conditions. Against this, a solution of potassium permanganate, 0.316 gram is

standardized. To determine the amount of ozone in the air of a room, a liter flask filled with water is emptied therein. The air replaces the liquid. Five mils of the standard ferrous ammonium sulphate solution is then run into the flask and gently agitated. It is then at once titrated with the standard permanganate solution, five mils of which will equal to 0.4 Mn. of oxygen. The statement is made that as little as 0.00002 gram of ozone may be detected in this way, since one drop of the permanganate is sufficient to impart a pink tint to five mils of the ferrous solution. That this latter is perfectly stable towards atmospheric oxygen is shown by the fact that no oxidation can be detected when 20 liters of air free from ozone is slowly bubbled through it. It is interesting to know that when large volumes of ozone have to be dealt with, fully as good results can be gotten by employing standard solutions of ten times the strength mentioned above. When this was done, though, it was noticed that the more concentrated standard solution of ferrous ammonium sulphate, which contained 39.2 grams of the salt to the liter, was not so permanent as the more dilute solution (*Comptes rend.*, 1917, 164, 430, through *Pharm. Journal and Pharm.*, April 7, 1917, p. 295).

INFLUENCE OF CARBOHYDRATES ON THE ACCURACY OF THE VAN SLYKE METHOD IN THE HYDROLYSIS OF CASEIN.—The presence of carbohydrates during the hydrolysis of casein by the method mentioned above causes a complete redistribution of the amino-acids, which varies according to the nature of the carbohydrate. It is very marked in the hexone bases, and a considerable loss of amino-nitrogen also takes place when the protein is hydrolyzed in the presence of xylan. Direct hydrolysis is, therefore, without reliance when used for the estimation of amino-acids in feeding stuffs; the great variation in the nature and the amount of the carbohydrates in feed stuffs makes it impossible to establish factors of correction for the results (*J. Biol. Chem.*, 1916, 241-249, through *Analyst*, March, 1917, p. 90).

HYDROTROPIC PHENOMENA.—C. Neuberg cites a number of instances of this useful phenomenon, which is the property of aqueous solutions of certain salts dissolving certain other substances which by themselves are insoluble in plain water. This property or phenomenon has been termed hydrotropism and has been made use of pharmaceutically, the caffein sodiosalicylate of the National Formulary being an instance. Among the substances having this property

are benzoic, salicylic, benzo-sulphonic acid, and various hydro-aromatic acids. Solution of these substances will dissolve or increase the solubility of carbohydrates, alcohols, aldehydes, proteins, alkaloids, fats, and lipoids, and quite a number of other substances. This ought to open up an interesting field of experimentation among pharmacists for making solutions for hitherto insoluble drugs. As an example we might mention mercury salicylate. This drug is very popular among physicians, who are, because of its insoluble nature, compelled to give it in an oily suspension (*Biochem. Zeit., J. Chem. Soc.*, 110, 2, 555).

RELATIVE TOXICITY OF STOVAINE AND NOVOCAINE.—According to Hatcher and Smith, who have given considerable attention to the study of these two drugs, stovaine is slightly more toxic than novocaine when administered in like manner. Recovery from toxic doses of stovaine is not so prompt as from corresponding doses of novocaine. They found no evidence to show that stovaine exerts any direct action on the blood-vessels after the intravenous injection of it in cats and practically none of the drug was excreted unchanged in the urine of these animals. Stovaine, they say, causes death by bringing about immediate and simultaneous paralysis of the heart and respiration, the action of each being independent of that on the other (*Jour. of Pharmacology*, 1917, 9, 4).

ESTIMATION OF FLUORINE IN SOLUBLE FLUORIDES.—A neutral solution of the fluoride is heated to boiling, and powdered calcium sulphate is added; after standing for one hour, with frequent stirring, the precipitate, consisting of calcium sulphate and calcium fluoride, is washed several times by decantation and collected on a filter. The latter consists of a disc of filter paper fitted into the bottom of a perforated platinum crucible. The precipitate is now washed (the wash water used should be saturated previously with calcium sulphate and calcium fluoride), then rinsed into an ordinary platinum crucible, and the water evaporated; the disc of filter paper is, meanwhile, ignited on the crucible lid and the ash introduced into the crucible. The dry contents of the crucible are then heated at 300° C. for one hour, or until constant in weight, then sulphated, again heated at 300° C., and weighed. The increase in weight after sulphating is due to the replacement of two atoms of fluorine by the sulphuric acid radicle, and a simple calculation gives the quantity of fluorine present. The error of the method is about 0.1 per cent. (*Amer. Jour. Sci.*, 1916, 42, 464-468, through *The Analyst*, March, 1917, p. 93).

IMPORTANCE OF THE VARRENTRAPP REACTION IN FATS AND OILS.—Notwithstanding the fact that hydrogenation in the presence of a catalyst is the usual way of converting unsaturated fatty acids into saturated ones, it seems possible that some of the older processes could be carried out on a commercial scale with the means now available. This applies especially to the Varrentrapp reaction, in which oleic acid is converted into palmitic acid by fusion with an excess of an alkali hydroxid. The reaction is not confined to oleic acid; all unsaturated acids may be converted into saturated acids of lower carbon content. It is said that the process as outlined is satisfactory: For whale oil; 2,500 kilos of the whale oil fatty acids are placed in an autoclave of 5,000 liters capacity, 800 kilos of sodium hydroxid dissolved in an equal quantity of water are added, and the mixture is heated at 260° C. for six hours. The pressure must not be allowed to exceed 10 atmospheres. The resulting mass, which is quite free from objectionable odor of whale oil, may be worked up into soap, or the fatty acids present may be liberated and distilled. The yield of fatty acids so liberated is about 85 per cent. of the quantity taken originally. The hydrogen liberated during the reaction may be collected and utilized (*Chem. Eng. and Manufacturer*, 1916, 24, 203-204, by W. Schrauth, through *The Analyst*, March, 1917, p. 91).

URINARY TEST FOR TRINITROTOLUENE (T. N. T.).—The method mentioned was first described by Webster and is as follows: 12.5 c.c. of urine is mixed with an equal volume of 20 per cent. acid sulphuric, and then extracted in a separating funnel with ether. The ethereal extract, after washing with water, is tested for trinitrotoluene by adding 5 per cent. alcoholic solution of KOH; if a purple color makes its appearance, which quickly turns to brown, the presence of trinitrotoluene is positively indicated (*Medical Press*, 1916, 537, through *The Analyst*, March, 1917, p. 89).

THERAPEUTIC WORTHLESSNESS OF PIPERAZINE AND OTHER ORGANIC URATE "SOLVENTS."—Hanzlik in the *Jour. Laboratory and Clinical Medicine* makes some statements in reference to the unreliability of this class of drugs in doing what is claimed for them. Maybe not so much now, but twenty-five years ago piperazine was much vaunted as a wonderful agent for promoting diuresis, and acting as a urate solvent. The investigator mentions that while excessive doses show a slight increase in the uric acid output, the same result can just as readily be brought about by giving the patient such well-known alkali salts as sodium bicarbonate or the citrates.

and, what is more to the point, at a great saving in price. He found that the solvent action of piperazine on calculi is practically negligible in weak solutions, although in more concentrated solutions there seemed to be some solvent action; however, it was very limited. No evidence was obtainable that this drug can prevent or remove urate deposits. While it was found that the direct addition of piperazine to urine renders the liquid alkaline, this does not occur when the drug is taken internally, for the reason that it is destroyed in its passage through the body and is without effect on the urine. He also brings out the interesting fact that piperazine does not influence diuresis, and that its administration is without value in the treatment of gout. The author also makes the statement that there is sufficient scientific evidence to prove that many of the so-called urate solvents, such as the following, are absolutely without any value in that direction: Urosin, lycetol, sidonal, quinic acid, lysidin, urol, quinoline, our old friend colchicum, and piperazine. At this point we cannot help but remark that probably the best diuretic is, after all, water (through *J. A. M. A.*, 807, 1917).

PITUITARY EXTRACT IN OBSTETRIC PRACTICE.—The fact that this drug very often exhibits powerful physiological action is a sufficient reason for insisting that it be administered, if administered at all, with the greatest caution. In selected cases, it is an exceedingly active oxytocic, and is without equal in that regard, yet the drug should never be used in normal obstetrics. The writer of this paper makes this last assertion very plain and gives good reasons for it. It is said that a number of cases had rupture of the uterus, and other ill effects followed its incautious use (*Amer. Jour. Obstet.; Med. Review*, p. 444, 1917).

CURRENT LITERATURE

PHARMACOLOGICAL STUDIES WITH COCAINE AND NOVOCAINE.

George B. Roth (Bull. No. 109, Hygienic Laboratory) has made a comparative investigation of these substances in intact animals and on isolated organs.

The results of the laboratory experiments with cocaine and novocaine, when compared with the results obtained in the clinical use of these substances, show that man is relatively more susceptible to cocaine and novocaine than are laboratory animals. From animal experiments it is seen that the toxicity of these substances depends partly upon the manner and method of administration. The state-

ment also seems to hold true for man. The untoward results that have been reported in the literature from the use of novocaine in operations about the head and face might well be accounted for by the fact that absorption may be very rapid, as for example in dental operations when the injection is made in a region well supplied with blood vessels, so that administration directly into the circulation is not unlikely to occur, and when injected in this way the toxicity is greater than when given subcutaneously. Individual susceptibility is marked in both animals and man. This may account for some of the fatalities reported in the literature.

In addition to idiosyncrasy, age seems to be a factor in man in the production of fatal results with novocaine. In the three cases reported by Scandola, 1915, the ages of the men were 69, 75, and 80 years, respectively. In cases having low blood pressure, or cardiac disease, novocaine should be used with caution, inasmuch as in the laboratory experiments it has been shown to have a depressing effect upon the heart muscle when large doses are given.

The administration of hyoscine, previous to the use of a local anesthetic agent, is sometimes advised. If it is given before either cocaine or novocaine, it may act as a synergistic agent in depressing the respiration. In order to prevent the absorption of novocaine from the subcutaneous tissues, epinephrine is employed. Epinephrine is a relatively unstable agent, especially in alkaline solutions. It is not unlikely, therefore, that unless the epinephrine which is used with novocaine is active, general symptoms may arise from the administration of novocaine as a local anesthetic agent.

The melting point of novocaine, as determined from the examination of 10 samples used in this investigation, varied from 153° to 157° C. The relative toxicity of cocaine and novocaine, as shown by animal experiments, varies; the variation being dependent mainly upon the animal employed as test animal. The relative toxicity of cocaine and novocaine for various animals when given subcutaneously is as follows: For frogs (*Rana pipiens*) the ratio is 1.0 to 1.4; mice, 5.5 to 1; rats, 10 to 1; guinea pigs, 10 to 1; and rabbits, 5.3 to 1. When given intravenously to rabbits, the ratio of toxicity of cocaine to novocaine is 3.9 to 1. When given intravenously the rate of administration is a factor in modifying the toxicity. The subcutaneous administration of large sublethal doses of novocaine in the dog and cat causes marked general symptoms which rapidly subside. The ratio of the toxicity of cocaine and novocaine for mice, when fed on cakes containing these substances, is much wider than

when given in any other way, cocaine being about 50 times as toxic as novocaine. Feeding mice on sublethal doses of novocaine for a period of weeks did not seem to confer immunity to cocaine when the mice were fed on cocaine in the same way.

The effects of novocaine on the isolated heart of the frog resemble the effects produced by cocaine, both substances causing a decrease in rate of the heart and a decrease in the extent of systole. The relative toxicity on the heart of the frog as determined by perfusion experiments is less for novocaine than for cocaine. On smooth muscle, the effect of novocaine differs slightly from that produced by cocaine. On the isolated ureter of the dog, the isolated urinary bladder and stomach of the cat, and the isolated uterus of the rabbit, the effect of novocaine differs from that of cocaine only in being stimulating to a less degree when similar dilutions are used. On the isolated intestine of the rabbit, cocaine stimulates in dilute solutions, and in concentrated solutions depresses intestinal motility, whereas novocaine depresses it in any effective concentration. On the blood pressure and respiration, both cocaine and novocaine increase blood pressure and respiration in small doses and depress in large doses. When given subdurally, the relative toxicity of cocaine and novocaine is practically the same, as shown by the comparative effects on the blood pressure and respiration. Death in rabbits after cocaine or novocaine poisoning is usually respiratory, but with novocaine under certain conditions, death may be cardiac.

1. Novocaine is several times less toxic for laboratory animals than cocaine, the relative toxicity being dependent upon the method of administration as well as upon the animal used in making the determination.

2. Novocaine possesses many of the properties of cocaine as shown by experiments on the isolated heart, on smooth muscle, and by its effects on the circulation and respiration of anæsthetized animals.

3. The depressing effect of novocaine on the blood pressure and respiration of animals makes it necessary to use caution in its administration in clinical cases in which the blood pressure is low or in which the heart is at fault.

4. Great care should be exercised in the injection of novocaine subcutaneously, in order to avoid its entrance into the circulation, thereby increasing its toxicity.

5. Individual susceptibility should always be considered in the administration of either cocaine or novocaine.

THE AMERICAN JOURNAL OF PHARMACY

JULY, 1917

THE PHARMACOGNOSY OF HELONIAS.

By JOHN MOSEK

The extensive use of this domestic drug in present-day medicine which led to its inclusion in Part II of the National Formulary, fourth edition, and the confusion between this drug and alertis due to the number of more or less misleading synonyms such as blazing star, star grass, unicorn plant, unicorn root, etc., as well as certain

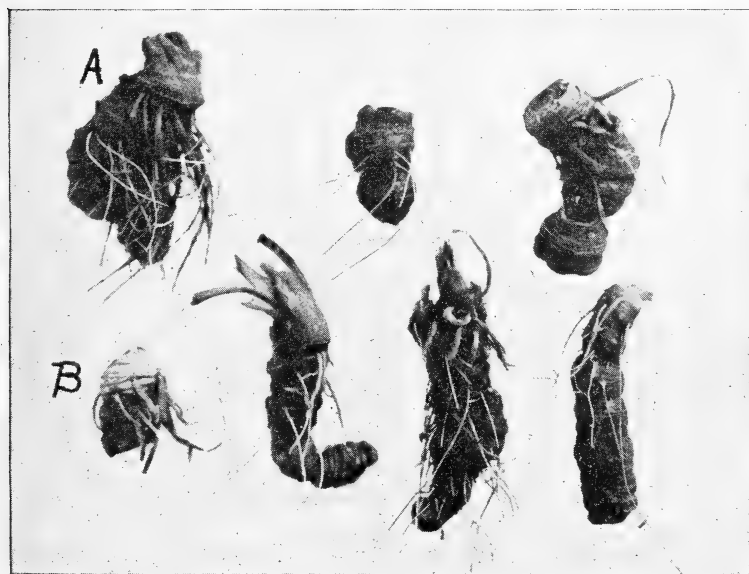


FIG. 1. Photograph, showing several types of *Helonias* rhizome: *A*, oblique rhizome with stem base and two stem scars; *B*, upright rhizome showing new growth at top.

errors and omissions in the official description of these drugs make it desirable that an effort be made to clear up the subject. *Helonias*, known in different localities as devil's bit, blazing star, drooping starwort, unicorn plant, false unicorn root, colic root, etc., is the dried rhizome and roots of *Chamaelirium luteum* (Linne) A. Gray, a smooth, perennial, diœcious herb of the lily family, growing in low grounds from New England to Georgia and westward. Authentic

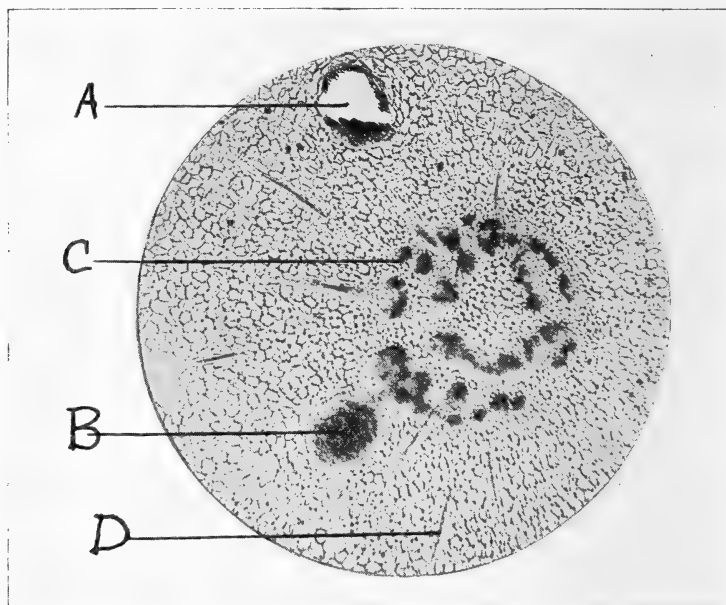


FIG. 2. Cross section of the central portion of a seedling rhizome of *Helonias*. It will be noted that the endodermal layer is indistinct. *A*, a foramen; *B*, a foramen with section of root in place; *C*, collateral mestome strand; *D*, narrow bands of trachea that extend from the epidermis to the pericycle.

specimens for use in this work were collected by the writer in the vicinity of Baltimore.

A medical history of *helonias* dates back to its use by the American Indian. It has long been recognized by the American Homeopathic Pharmacopœia, and is now included in the National Formulary. Judging from the amount used in present-day medicine, it ranks among the important domestic drugs.

The chemical constituents of helonias have never been properly investigated, nor has its pharmacognosy been thoroughly gone into, as the National Formulary, fourth edition, fails to mention its most striking characteristic, a feature recognized by Millspaugh in his work "Medicinal Plants," published in 1892.

This feature is aptly described in these words. "When the root (rhizome) is cut across it will be plainly noticeable that the

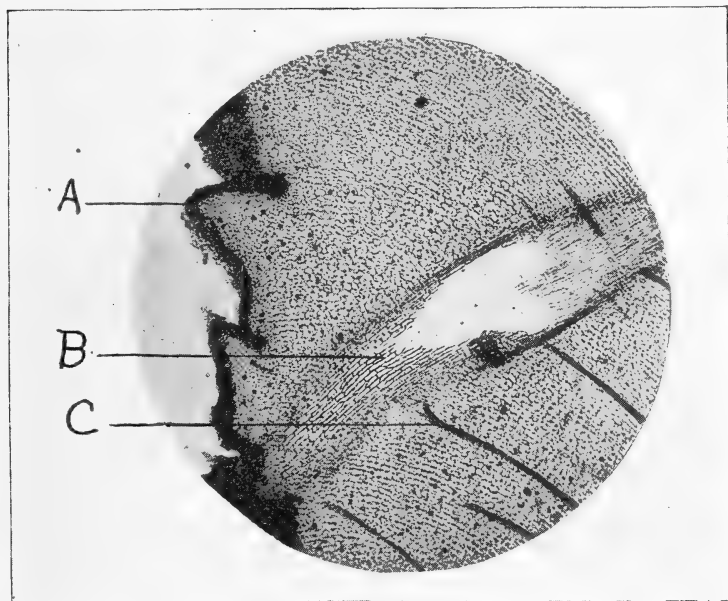


FIG. 3. Radial-longitudinal section of *Helonias* rhizome. *A*, epidermis, showing annuli; *B*, foramen, showing cells of the tube wall; *C*, bands of narrow trachea.

fibrous rootlets pierce the cortex through ample foramina, in which they are freely movable like threads in the eye on a needle."

The drug consists of an annulate rhizome of upright or oblique growth (Fig. 1), 1 to 5 cm. long, 0.5 to 1 cm. in diameter, bearing at the crown numerous leaf bases or in rhizomes of oblique growth, one or more stem scars in addition. Below there are numerous roots, often stripped of their cortical layers, and piercing the cortex of the rhizome through characteristic openings. They enter the cortex of an upright rhizome at an angle of about 45 degrees, are

more numerous in the newer growth near the crown and are often decayed in the older parts of the rhizome. The lower portion of the rhizome, representing growth two or more years old, often decays and disappears causing the rhizome to end abruptly. The color varies from light brown to yellowish; fracture of the rhizome tough and horny; odor slight; taste bitter.

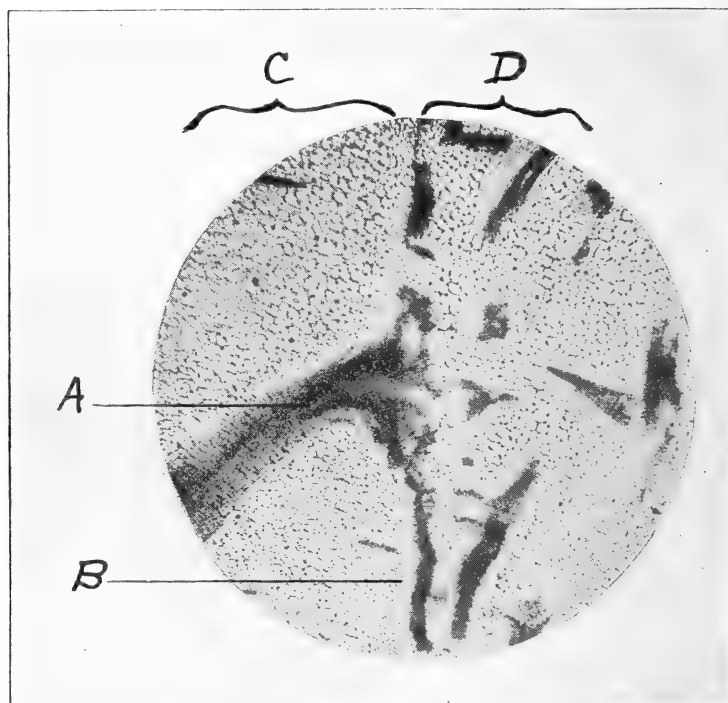


FIG. 4. Radial-longitudinal section of the central portion of *Helonias* rhizome. *A*, entering root, showing manner in which the root divides just inside the pericycle, and connects with the vascular system of the rhizome. *B*, endodermal layer; *C*, cortex; *D*, central cylinder.

Helonias rhizome presents a most interesting structure, and is a fine illustration of the fact that nature refuses to follow man-made laws. Fig. 2, a transverse section through the central portion of a seedling rhizome, shows the foramina spoken of by Millspaugh, cut obliquely. They may appear in any portion of the cortex, and as will be later shown, vary in size and appearance according to

their location. Narrow bands of trachea extend from the epidermis entirely through the cortex, to and even through the pericycle. There is no distinct endodermal layer and the mestome strands are of the collateral type.

Fig. 3, a radial-longitudinal section through the cortex of *Helonias* rhizome, shows a foramen in longitudinal section. The walls

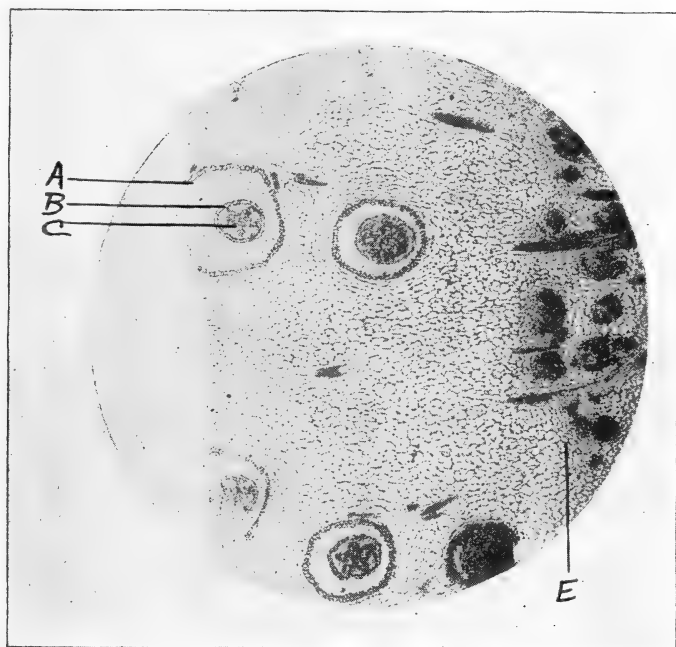


FIG. 5. Section of *Helonias* rhizome, cut at right angles to the entering roots, or at an angle of about forty-five degrees. This section shows five roots entering the cortex through their respective foramina. It will be noted that the cortex of the roots gradually narrows as the roots approach the central cylinder. It also gives an excellent view of the tube walls, which are seen to be uniformly thickened. *A*, tube wall; *B*, endodermal layer of root; *C*, pentarch mestome; *E*, endodermal layer of rhizome.

of these root-carriers are made up of longitudinally elongated cells which are regular, moderately thickened and lignified, reacting to phloroglucin.

A continuation of this tube with the root in place is shown in Fig. 4, ending just inside the pericycle. Here the mestome of the

root divides, connecting with and forming part of the vascular system of the rhizome.

Fig. 5 shows an oblique section of a portion of helonias rhizome, cutting the root-carrying tubes with their contents at right angles. The walls of the root-carrying tubes consist of from one to three layers of cells which are uniformly thickened. The epidermis of the contained root has disappeared and the cortical parenchyma, somewhat altered, gradually narrows as the root approaches the pericycle.

The endodermal layer of the root, enclosing the pentarch radial mestome, persists practically unchanged until it reaches the pericycle. Here the endodermal layer disappears, while just inside the pericycle the mestome divides, sending out branches of the collateral type. Helonias is thus shown to possess characteristics that enable its identification to be accurately and quickly determined. It should be added as diagnostic aids in the study of the powder, that helonias rhizome contains much starch and numerous cells filled with bundles of raphides of calcium oxalate. The endodermal cells of the root are thickened on their inner walls, have a narrow lumen, and very numerous simple pores, the radial walls appearing sinuate from their close proximity. Root hairs are very numerous.

A THESIS ON TOPICAL APPLICATIONS, THE METHODS OF PREPARATION AND MEANS OF DISPENSING, FOR THE TREATMENT OF DISEASES OF THE EYE.

SUBMITTED BY C. ELBERT HOFFMAN, P.D., P.C.P., 1909, FOR THE DEGREE OF
MASTER IN PHARMACY, PH.M., IN THE PHILADELPHIA COLLEGE
OF PHARMACY

Realizing that the products of some of the pharmaceutical methods have been unsatisfactory from the standpoint of the practicing pharmacist as well as the practicing ophthalmologist, the author presents this thesis with the knowledge that the products secured by the careful following of its formulæ are not only highly eligible but present the compounds or mixtures in the most effective form.

While the work on glycerite of boroglycerin is entirely original I am indebted to Dr. Conrad Berens for his encouragement and suggestions in my investigation.

BOROGLYCERIN.

	Gm.
℞ Boric acid	620
Glycerin—a sufficient quantity to make	1,000

Heat nine hundred and twenty grammes of glycerin in a tared porcelain dish to a temperature between 150° C. to 160° C. and add the boric acid in portions, stirring constantly until all the boric acid is dissolved and continue the heat until the mixture has been reduced to 1,000 grammes.

GLYCERITE OF BOROGLYCERIN, 60 PER CENT.

	Gm.
℞ Boroglycerin	600
Glycerin—a sufficient quantity to make	1,000

Heat the boroglycerin and 600 grammes of glycerin in a tared porcelain dish to a temperature between 150° C. to 160° C., until the mixture has been reduced to 1,000 grammes. When made according to the above formula this glycerite of boroglycerin has the specific gravity of 1.35 at 25° C.

Glycerite of Boroglycerin in the Treatment of Trachoma, "Granular Conjunctivitis."

Trachoma is a disease of the conjunctiva palpebrarum characterized by infiltration of the follicles, which are distended by the products of the inflammatory processes.

It is highly contagious and when neglected often destructive of vision.

The writer's attention was called to the promising action of glycerite of boroglycerin made according to the old formulæ and he was urged to attempt the task of improving it by increasing its percentage of boric acid and rendering the product anhydrous.

In the pursuit of these objects entirely new methods of preparing glycerite of boroglycerin were devised, especially in the application of heat and the attainment of what heretofore appeared to be forbidden temperatures.

The formula evolved by a long series of experiments is herewith presented.

The product is anhydrous and contains 60 per cent. of boroglycerin, which contains 62 per cent. of boric acid, and in the hands

of many skilled ophthalmologists has proved of inestimable value in the treatment of trachoma, indeed frequently causing a complete recovery and without cicatrices.

Of the formulæ for the other medicaments it may be said that in several instances the refinements in method of compounding have resulted in more perfect, efficient and eligible preparations.

OINTMENT OF GLYCERITE OF BOROGLYCERIN.

	Gm.
℞ Glycerite of boroglycerin	20
Sodium borate	2
Spermaceti	20
White wax	20
Oil of sweet almond	38

To the spermaceti and white wax which have been melted add the oil of sweet almond and continue the heat to a temperature of 80° C. To the glycerite of boroglycerin add the sodium borate and bring to a temperature of 120° C. and continue until all of the sodium borate has been dissolved. Add the mixture of the glycerite of boroglycerin and sodium borate to the oil mixture and stir rapidly and continuously until the ointment congeals and becomes of a uniform consistence.

This ointment is very hygroscopic and must be placed immediately in sealed tin tubes or air-tight containers.

OINTMENT OF CITRATE OF COPPER IN GLYCERITE OF BOROGLYCERIN.

	Gm.
℞ Citrate of copper	8
Glycerite of boroglycerin	80
Wool fat	2
White petrolatum	10

Heat the glycerite of boroglycerin to 125° C. and slowly add the citrate of copper and continue the heat until all of the citrate of copper has been dissolved. Remove the heat and when the mixture has cooled to 75° C. add the wool fat and white petrolatum and stir constantly until it has cooled to 50° C. and transfer to airtight containers.

Copper citrate was brought to the writer's attention as being a most valuable agent in the treatment of certain varieties of trachoma and of disturbances of the follicles of the ciliæ.

The objection to all former preparations of copper citrate was the inability to procure a base that would dissolve the copper citrate.

After many experiments it was found that copper citrate was soluble in glycerite of boroglycerin and in this way it is possible to make a perfect and permanent ointment.

OINTMENT OF IODOFORM.

	Gm.
℞ Iodoform, in very fine powder	10
White petrolatum	90

Heat a white porcelain mortar to 60° C. and rub the iodoform with a small quantity of the white petrolatum, then incorporate the remainder of the white petrolatum and triturate until it congeals.

Iodoform is very valuable in ointment form, used as a dressing for wounds of the ocular region.

For this purpose it should be divided as finely as possible; there should not be visible even with a powerful lens the minutest crystals, for if present they act as irritants.

In all ointments of iodoform and combinations thereof white petrolatum has been found to be the best base.

OINTMENT OF CASSARIPE.

	Gm.
℞ Cassaripe	10
White petrolatum	90

The cassaripe is heated to 60° C. and the white petrolatum is slowly added and the mixture stirred until it congeals.

Cassaripe ointment is now commonly used in the treatment of corneal ulcer.

OINTMENT OF CORROSIVE MERCURIC CHLORIDE.

	Gm.
℞ Corrosive mercuric chloride	1
Sodium chloride	1
Distilled water	5
Wool fat	20
White petrolatum to make	5,000

Dissolve the corrosive mercuric chloride and the sodium chloride in the distilled water and add the wool fat and white petrolatum and mix thoroughly.

This ointment is a good base for other remedies, providing they contain no incompatible substance.

OINTMENT OF YELLOW MERCURIC OXIDE.

	Gm.
Rx Yellow mercuric oxide	1
White petrolatum	99

In a white porcelain mortar which has been heated to 60° C. place the yellow mercuric oxide and triturate with the white petrolatum, the latter a little at a time until the oxide is completely incorporated.

The yellow mercuric oxide should be made by the wet process for this ointment.

The finished product must be absolutely free from any visible particles of the oxide even when a thin film is spread upon clear glass.

This ointment is probably more frequently used in ophthalmic practice than any other.

ALKALINE ANTISEPTIC SOLUTION.

	Gm.
Rx Camphor	
Thymol, aa	0.54
Sodium chloride	
Sodium benzoate, aa	5.40
Sodium bicarbonate	11.00
Oil of spearmint .....	.60
Oil of eucalyptus	
Oil of pine needles, aa .....	.90
Alcohol	10.00
Glycerin	27.00
Water, q.s.	1,000.00

It is the purpose of the above solution to act as an alkaline cleanser and render the parts aseptic and produce exosmosis.

In order to have this exosmotic effect it will have to be of a specific gravity lower than 1.020. This solution when made according to the above formula at a temperature of 70° F. will have a specific gravity of from 1.0185 to 1.0190. The alcoholic strength is reduced to a minimum so as to lessen the irritating effects.

This preparation is used as an eye lotion because of its thorough cleansing, antiseptic properties.

The alkalinity is just sufficient to make it act as a good cleansing agent.

FORMALDEHYDE PRESERVING JELLY.

℞ Gelatin	1 ounce
Solution formaldehyde	2 drams
Egg albumen	½ ounce
Glycerin	8 ounces
Water	20 ounces

Break the gelatin into small pieces and allow it to soak in twelve ounces of water for ten hours, then transfer to a porcelain vessel, add the egg albumen and the remaining eight ounces of water and the glycerin; heat until all of the egg albumen has coagulated, allow to simmer for ten minutes, filter, and while still liquefied but cooled to 60° C., add the solution of formaldehyde and allow to congeal.

This preparation is used for the preservation of eye specimens and is most satisfactory as it is almost perfectly transparent.

For preserving a specimen the jelly having been carefully heated to liquefaction only is poured over the specimen and the container sealed.

Working with the following substances I have accumulated the following practical experiences.

Acacia is generally employed as a mucilage; when used as a powder vehicle should be in as fine a state as possible.

Acid Boracic, in eye lotions, is generally used from 1 per cent. to 4 per cent. solutions and in ointment forms from 5 per cent. to 10 per cent. In every instance the chemically pure drug only should be used.

Acid Picric: in making solutions there should be 50 per cent. of glycerin; the ointments should have the acid in solution before incorporation.

Acid Salicylic, to be used in ointment form, should first be dissolved in a small percentage of olive oil, and then incorporated with the base.

Alcohol as a stimulant in eye lotions should not exceed 2 per cent.

Alum is generally used in solution in combination with boracic acid. Borax should never be used in combination with this chemical.

Antipyrine, when prepared for eye solutions, should never be dispensed with tannic acid, calomel or the salicylates. It is gen-

erally used in aqueous solutions, ranging from 5 per cent. to 10 per cent.

Aqueous Solutions for ophthalmic use should be carefully filtered before being dispensed.

Aqua Camphoræ: it is important that all alcohol be evaporated in the preparation of this solution for ophthalmic use.

Argyrol should always be freshly prepared with distilled water and dispensed in a dark bottle.

Aristol, when prepared for eye work, should always be dissolved in sterile olive oil.

Atropine, when used in its alkaloidal state, should first be dissolved in olive oil and then incorporated in ointment form or further diluted with the oil for dispensing.

Boroglycerin and its compounds have been previously described.

Calomel, for ophthalmic work, should be an amorphous powder. It should never be dispensed if the patient is known to be taking iodides.

Chlorine Water. This solution, for ophthalmic work, should consist only of the gas in water from 0.4 per cent. to 0.5 per cent. solution. As a compress a drachm of this solution to eight ounces of hot water is about the proper percentage.

Cocaine, when used in the alkaloidal form for local anæsthesia, should be dissolved in freshly sterilized olive oil. It should never be dispensed in combination with zinc or sodium salts.

Collodion, when used on wounds in the ocular region, should contain a small percentage of iodoform.

Copper Sulphate, when dispensed for eye work, should contain a small percentage of glycerin. It should never be used after applying an alkaline or silver nitrate solution.

Copper Citrate is used as an astringent in combination with glycerite of boroglycerin.

Ethyl-morphine hydrochloride forms a saturated solution at 10 per cent. It is generally prescribed in from 3 per cent. to 10 per cent. solutions and frequently in combination with atropine or eserine and should be dispensed in dark glass.

Fluorescein is used in solution for staining ulcers. The solution acts best when of 2 per cent. strength rendered alkaline with the addition of 3.5 per cent. of sodium bicarbonate.

Gelatin is used in the manufacture of ophthalmic discs and for making formalin preserving jelly previously described.

Glycerin is generally used as a solvent and in the preparation of other compounds.

Holocaine is the most delicate substance we work with. Glass vessels should be avoided in preparing and preserving the solution, as the small quantity of the alkali derived from the glass precipitates the drug. Porcelain should be the container of choice.

Homatropine hydrobromide is generally prescribed in from 2 per cent. to 3 per cent. solution rendered sterile.

Hydrastis. When this preparation is written for in liquid form the colorless preparation should be dispensed.

Iodoform. The mode of preparation for ointment has been previously described. When dispensed in powder form boracic acid is the best diluent.

Mercury is a most important chemical in the manufacture of ophthalmic pharmaceuticals. The bichloride of mercury and yellow oxide of mercury ointments have been described. The other salts of mercury are generally prescribed for internal use. Metallic mercury is usually dispensed as mercury ointment 50 per cent. U. S. P.

Pilocarpine and its salts are incompatible with tannin, iodides, alkalies, corrosive sublimate and silver nitrate.

Potassium Iodide is used both internally and externally in ophthalmic work. In ointments it should first be dissolved in water at saturation and then incorporated with wool fat.

Physostigmine or *Eserine* solutions should always be dispensed in dark bottles. Solutions that have acquired a dark color should be rejected.

Silver Nitrate is used both in crystal form and in solutions and must be dispensed in dark glass.

Sodium Borate is generally prescribed in solution as a detergent.

Sulphur, when prescribed in ointment form, should be carefully incorporated with a white petrolatum base.

Zinc Salts are generally prescribed in solution. In the preparation of the solution all borates must be avoided.

Pipettes or medicine droppers, for use with ophthalmic solutions, should be regulated to such a point that one drop will be equivalent to one minim. After very many tests it has been found that a dropper 2.2 Mm. outside dimension with an opening 1.1 Mm. and the wall of the glass barrel 1.1 Mm. on each side will form as nearly as possible a minim drop.

Potash-lime glass should be used for this purpose as it can be worked more exactly.

The width of the pipette after tapering from the point should be of such a diameter as to consume the entire amount of liquid that will be drawn up by releasing the pressed rubber bulb. In this way no liquid will come in contact with the rubber.

A dropper with a flange should be used only with solutions intended as eye lotions. This flange makes it less harmful should the tube accidentally be forced against the eye.

Bulbs are next to be considered. These are supplied in several colors according to the composition. All bulbs will oxidize to a certain extent and it is this uncombined substance on the inner surface of the bulb that works its way into the solution and when applied to the eye causes considerable irritation.

In all cases the bulb should be most thoroughly cleansed before dispensing. Collapsible tubes for all ointments and glycerites are by far the most convenient and sanitary method for dispensing.

A tube for this purpose must be made of pure tin and finely finished.

Different preparations require different sizes of openings for the release of the contents. In any case the cap must fit securely and seal the package.

After a tube has been deprived of some of its contents it is always advisable to thoroughly cleanse the tip before replacing the cap.

A bottle with a dropper stopper is the most satisfactory method of dispensing eye drops.

Solutions ranging from twenty minims to one half ounce can easily be dispensed in a half-ounce bottle.

The bulb is made with an enlargement on the outside so that it can only go just so far into the neck of the bottle and has a groove on the inside which is filled by the flange on the top part of the glass barrel. This groove serves to answer two very important purposes. It prevents the glass barrel from moving up or down and with the bulb properly fit into the bottle allows the glass barrel to come very close to the bottom of the bottle.

Eye drops bottle should be fitted with a glass barrel that will correspond to the dimensions given under pipettes where one drop is equivalent to one minim. The eye lotion bottle is made under the same conditions, only of a larger capacity. In this case a dropper of almost any size may be used.

Eye baths are used where it is the intention to have the solution

come and remain in contact with the eye for a considerable space of time. The cup is partially filled and in this condition is pressed against the eye, the head is thrown back and the lids of the eye are opened and closed several times.

Eye baths are made in various designs and combinations. The one most commonly used is the glass one with a shaft and base.

The aluminum bath is an excellent one because it can be easily sterilized without danger of breaking.

Eye irrigator: This apparatus is by far the most sanitary of any appliance used for washing the eye with a fluid.

It consists of a bottle of about one and one half ounce capacity and a curved metal tube, which extends from near the bottom of the bottle to about three inches curved out from the top, which carries a very fine stream and is forced out under air pressure. In this way the solution remains in a perfectly sterile condition until used.

The force of the flow is somewhat lessened by having the end of the tube slightly enlarged.

The flow is very easily checked by turning the bottle half on its side so that the tube carrying the liquid is not immersed at the end.

This little appliance is so complete that it can be operated perfectly with one hand.

Eye patches are used where it is the intention to protect the eye completely from light. These come in various colors, combinations and styles. The best patch is the soft-linen patch as it is more comfortable and acts as a better protector.

These come for right and left eye and in combination. They are also used to support compresses.

OPHTHALMIC DISC CONTAINERS.

These generally come in two styles, the vial and the celluloid case. The celluloid case is the more practical; it being pure white enables one to see the disc more readily.

The disc can easily be removed for application by moistening the tip of a camel's hair brush to which it will readily adhere and may then be carried directly to the conjunctival sac.

When a physician prescribes smoked glasses to be worn during mydriasis it is his intention that the patient be supplied a glass that will protect the eye from as much light as possible.

Under these conditions the best glass to furnish is a glass with very large lens and which for its support does not depend upon a bridge but rests against the sides of the nose and eyebrows.

BOTTLE WITH BULB FOR FLUSHING.

This consists of a bulb of about two ounces capacity and a large wide-mouthed bottle of eight ounces capacity having a glass cover.

The outfit is for use where it is the intention to flush the eye with a large quantity of fluid.

The bulb fits the bottle in such a manner that it becomes airtight after pressing and placing the end of the dropper into the bottle to the body of the bulb and releasing the bulb.

The dropper barrel for this appliance should be considerably larger than one used for eyedrops so that the flow will be much greater and with less force.

Ointment pots or jars for dispensing eye ointments should be composed of opal glass. There should be no metal covering used unless protected from the contents by paraffine paper. A very good jar to use is one composed entirely of glass; or one where the base is of opal glass and the cover celluloid.

Glass Applicators are small devices for the application of ointments or semi-solid substances to the eye. The more common is the plain piece of glass slightly tapered at the ends on which the medication can be placed and transferred to the eye.

An applicator more adapted to ointments is flattened on one end and rounded so as to remove all sharp edges.

CRITICISMS AND SUGGESTIONS ON MAGMA¹ MAGNESIA.¹

BY SISTER BERTHA MUELLER, ASSISTANT APOTHECARY AT THE GERMAN HOSPITAL, PHILADELPHIA.

Ever since the proprietary preparation, milk of magnesia, has been placed on the market and become so popular, attempts have been made by the pharmaceutical profession to develop a good working formula for the making of that preparation, but so far all

¹ Read at the annual meeting of the Pennsylvania Pharmaceutical Association, June 19-21, 1917.

the formulas advanced have been only partly satisfactory. Let us just briefly review some of the shortcomings of the most important formulas.

We all know, for instance, that the N. F. III formula was unsatisfactory in that it took actually months for the magma to settle down to the required volume. Of course, in order to avoid that inconvenience, directions were given to transfer the magma to a muslin strainer and allow to drain. That, however, is not a very satisfactory way of doing, because of the messiness attending the process. Furthermore, by bringing the magma down to the required volume in order to have a preparation in accordance with the N. F. III requirements, one incurred the still greater embarrassment of having a product that was not pourable. To correct this shortcoming, various modifications of the formula were suggested, such as boiling the magma, reducing the amount of water, etc. As all these changes, however, proved more or less unsuccessful, the conclusion was drawn that it was practically impossible to prepare a satisfactory magma by the interaction between magnesium sulphate and sodium hydroxide. Some other chemical, it was thought, was necessary to react with sodium hydroxide in order to obtain a satisfactory preparation. Hence, in the present U. S. P. formula the magnesium sulphate is replaced by magnesium carbonate; a change which is unfortunate. In the first place, magnesium carbonate is at all times more expensive than magnesium sulphate. Secondly, the sodium carbonate resulting from the interaction between magnesium carbonate and sodium hydroxide is necessarily considerable, and for that reason the preparation requires a great deal of washing in order to free it from the nauseating alkaline taste which sodium carbonate, as long as the merest trace is present, lends to it. Lastly, magnesium carbonate, being insoluble in water, cannot possibly be freed from those accidental mechanical impurities which are present in all chemicals in varying amounts. Therefore, this feature of insolubility is a matter of no small consideration, for if we wish to have a first-class preparation, it must, above all things, be free from an admixture of mechanical impurities.

In recent years still another method has been advanced, which, if it only yielded a more satisfactory product, would indeed, to the busy pharmacist, be a very welcome method. The chemical, marketed for the express purpose of preparing magma magnesia by this method, is said to be a hydrated magnesium oxide which, in order

to prepare the magma, is simply mixed with water, allowed to stand for twenty-four hours, shook up, and the process is completed. We have tried that method, but find it does not yield as satisfactory a preparation as one would wish it to be. In the first place, the magma is rather grayish in color, probably due to insufficient purification of the hydrated magnesium oxide. Secondly, the magma does not stand up well; is quite gritty, and if allowed to stand for some time, cakes into a solid lump, which appears rather gluey and is very hard to shake up. It is indeed to be regretted that hydrated magnesium oxide, as it is marketed at present, falls short of yielding a satisfactory magma; for the fact remains that this method would be the ideal method. It is to be hoped that the manufacturers of hydrated magnesium oxide will continue to work with the chemical with a view to improving it so that eventually it can be made to yield a satisfactory product.

Perhaps it would not be amiss right here to draw attention to the fact that the beautiful white color, which some very popular brands of milk of magnesia appear to have, but in reality do not have, is achieved by bottling the magma in glass bottles of a strikingly beautiful pale blue tint. How simple and yet so successful a trick!

After considerable work on magma magnesia, it has been our experience that a really nice magma can be prepared according to the N. F. III formula, somewhat modified. If dried magnesium sulphate is substituted for the ordinary sulphate, and the amount of water reduced, no difficulty in working the formula will be experienced. It is a strange phenomenon, yet it is certain that dried magnesium sulphate exhibits different physical properties from ordinary magnesium sulphate. This feature is clearly brought out in making magma magnesia. If dried magnesium sulphate is used, a nice smooth magma is obtained which subsides very rapidly, indeed so rapidly that a fresh washing can be given it every ten to fifteen hours, which enables one to have the preparation finished in less than a week's time; while a magma prepared exactly according to the same formula, but with ordinary magnesium sulphate, is rather lumpy and requires at least several days to subside; thus considerable time is required for its manufacture.

The following formula has been tried a number of times by different workers, and has always produced the same satisfactory results:

Magnesium sulphate, dried	270.0
Sodium hydroxide, U. S. P.	120.0
Distilled water to make	1,000.0

Dissolve the magnesium sulphate in enough water to make 750 mls and filter; dissolve the sodium hydroxide in enough of water to make 250 mls; filter. Pour the sodium hydroxide solution into the magnesium sulphate solution; mix well, and bring up to 4,000 mls with distilled water. Wash by decantation, bringing up the volume each time to 4,000 mls. Continue washing until the supernatant liquor, when tested with barium chloride test solution, does not show more than traces of sulphate. When assayed by the official method, the magma contains not less than 6.5 per cent. nor more than 7.5 per cent. of magnesium hydroxide.

TINCTURA CINCHONÆ COMPOSITA.¹

BY THOMAS D. McELHENIE, BROOKLYN, N. Y.

Imprimis: The most soluble form of the alkaloids of cinchona is the hydrochloride. It has always seemed to me in the course of fifty-odd years in the drug trade a very curious thing that the universally used salt of quinia at least in English-speaking countries should be the sulphate and that this should come in the course of successive generations to be so commonly the name that when quinine was mentioned "quinine sulphate" was understood to be the variety intended and neither the alkaloid nor any other salt was thought of for many years.

Probably the real reason was for the discoverers that they could make it that way cheaper, as the calcium sulphate was so easily got rid of.

Pondering thus, I have had in mind for a long time to try the merit of hydrochloric acid in the maceration of the ground mixed drugs for a lot of the compound tincture and on November 26, 1916, as a preliminary trial of the solvent effect of the weak acid one per cent. by volume on the reddish brown sediment always present in the finished tincture, after standing a month or so.

I had about 2,000 mls of the regular official tincture from a lot

¹ Read at the meeting of the New Jersey Pharmaceutical Association, June 13, 1917.

dated May 27, 1912, and after shaking well I put into a quart packer marked for 1,000 mils and containing 10 mils of hydrochloric acid, enough of the turbid tincture to make 1,000 mils. This portion represented here by Sample *A* is at this date, May 30, 1917, entirely limpid, showing that the trifle of cinchotannic acid sediment with probably some little alkaloid carried down in it was entirely soluble in the 1 per cent. acid menstruum. The remaining portion of the stock of tincture, about 1,000 mils, was turned unfiltered into the shelf bottle for observation, on November 26, 1916, pouring off clear when needed. It has still of course the sediment as before or a little more about $\frac{1}{8}$ inch deep in a quart shelf bottle. Shown here as sample *B*. In another quart packer on the same date I started 1,000 mils of the same tincture including 10 mils of acid to macerate until wanted when I confidently expect to percolate a perfectly clear tincture of the chlorides of the cinchona alkaloids which will remain clear, carrying all the alkaloids as chlorides, and the cinchotannic acid. After that lot has been finished a few months I will report on it if I am still in the harness. Perhaps at next year's meeting it will be an appropriate time. I cannot at present think of any prescription combination in which the slight trace of acid here suggested would be any way objectionable.

BROOKLYN, N. Y.,

May 30, 1917.

COMMERCIAL TRAINING FOR PHARMACISTS.¹

BY ROBERT P. FISCHER, B.Sc., PHAR.D.

The need for commercially trained pharmacists is an acute one if the trend of the profession is accurately recorded in the pharmaceutical press and in pharmaceutical meetings. It is therefore no longer necessary for those advocating commercial training to apologize for usurping a place in the pharmaceutical sun. On the contrary, many close students of the present-day pharmaceutical situation are beginning to wonder whether the time is not coming when those who have scientific papers to present before pharmaceutical associations will not in their turn open their remarks with

¹ Read at December, 1916, meeting of N. Y. Branch A. Ph. A.

an apology for taking up valuable time that might better be devoted to a discussion of business problems and financial profit possibilities.

What the whole situation requires is the acceptance of a common-sense viewpoint on the part of teachers, retailers, students and others who are interested in the practice of pharmacy of to-day. I am not in sympathy with those who wish to displace a large portion of the present minimum pharmaceutical curriculum with business training any more than I am in sympathy with those who begrudge even the small period of time—about 60 hours—that the better schools of pharmacy are devoting to the subject.

There must be a willingness to give and take in this matter if pharmacy is to be served properly.

We all recognize what pharmacy is to-day and it is foolish to try to make ourselves believe that it is on a higher plane than actual conditions demonstrate.

Our colleges of pharmacy are attempting to elevate the profession of pharmacy to their high standards and practical men everywhere are trying to make the colleges recognize the fact that in order to really serve the profession the colleges should take cognizance of conditions in the trade and adapt their curriculum to the situation in such a manner as to turn out men who would be trained and valuable for the present-day drug store. That, in a nutshell, is the situation and thus far many of the colleges have responded by instituting short courses in commercial training—with emphasis on the short.

It is expecting too much of both student and instructor in commercial pharmacy to feel that just because a college gives a short course in commercial training its graduates should make good as business men. To be sure they are much better prepared for business life after having taken such a course than they are without having taken it, but the other learned professors on the pharmaceutical faculties must also help to make our 1917 graduates and those who follow them good assistants to the average retail druggist of to-day or good business men in their own stores.

Those who advocate discontinuing some of the scientific instruction given in the present pharmacy course and substituting more commercial training for the same are often asked what branch of the curriculum may be eliminated or curtailed. Invariably the first subjects mentioned are botany and pharmacognosy.

Yet a knowledge of the habitat and characteristics of vegetable

drugs as well as climatic effects upon their growth, etc., is quite essential to the shrewd buyer. But how many teachers of botany and pharmacognosy ever handle the subject from this point of view? They are usually profound students of the subject and teach what custom dictates every educated pharmacist should know about these sciences and they usually teach it in a highly scientific way, regarding any commercial consideration of the subject as beneath their dignity.

It is necessary to remember that we are not, in this day and generation, teaching pharmacists who will go out and collect green drugs, dry and grind them and manufacture them into elegant preparation. We are teaching men who to-morrow will be in the thick of the fight for a living out of a business which has some professional trimmings but requires the ability to utilize these trimmings in a commercial way for success.

Chemistry is a big subject, which requires four years of undergraduate study and some more postgraduate work in our universities before it is felt that the student or graduate knows enough to speak with authority on the subject. Yet we try to make our men master chemistry in two short years and crowd the work in at an enormous rate, with the result that there is little time for absorption, because it is all needed for cramming. Chemistry is invaluable to the pharmacy student, but it should be handled from the viewpoint of the pharmacist. Our professors are victims of a system which does not recognize that the object of teaching chemistry in a pharmacy school is not to turn out chemists but to turn out good pharmacists, just as the object of teaching botany is not to develop botanists but better pharmacists. Here, too, a consideration of the commercial aspects of the subject from the pharmaceutical standpoint is a crying need.

The time has come when the traditions of the past must be shaken off, for they have burdened us heavily for too long a time.

Commercial training must mean more than bookkeeping, accounting, selling and advertising in the future. It should be considered in connection with every subject in the curriculum and the men now teaching the various subjects at our colleges will find a keener interest in their work, on the part of students, if it is approached from the present-day retail druggists' standpoint. And further than this, the colleges will then be fulfilling their mission, which is to provide trained men to meet the needs of the hour.

PRODUCTION OF HYDROGEN BY THE IRON CONTACT METHOD.¹

BY HARRY L. BARNITZ, PH.G.

One of the methods that has found favor in recent years for the production of hydrogen in installations of large commercial capacity is the so-called "iron contact method."

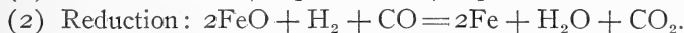
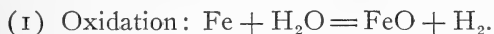
The generating elements employed by this method are coke and water, and through them hydrogen can be produced of almost "chemical purity," *i. e.*, of a purer grade than by many other technical processes for large production excepting electrolytical.

The iron contact method is cyclic with respect to the "iron contact mass"; that is, this iron contact mass is used over and over again. If red hot iron is sprayed with a jet of steam, the iron is oxidized and forms iron oxide, while hydrogen is liberated. If the iron oxide thus produced is treated with reducing gases, such as generator gas, water gas or illuminating gas, the iron oxide is reconverted into sponge iron.

All these reducing gases consist chiefly of a mixture in varying quantities of carbonic oxide, hydrogen and hydrocarbons.

For instance, the commonly employed water gas, which is easily produced by means of coke and steam in producers of large working capacity (say up to 100 cubic meters per hour), gives a theoretical mixture of 50 per cent. CO and 50 per cent. H. In practice, however, this gas always contains large quantities of impurities, emanating from the coke during the process of generation, averaging about 6 per cent. N, 4 per cent. CO and 2-3 per cent. hydrocarbons and sulphides.

The reactions used in the iron contact process may be represented by the following formulæ:



It will be observed that equation (2) is exactly the reverse of equation (1) at least as far as steam is concerned.

The reaction takes place at the surface of the "contact mass." Only where the fresh gases enter, a powerful and far-reaching re-

¹ Reprinted from *Metallurgical and Chemical Engineering*, Vol. XVI, No. 10, May 15, 1917.

action generally takes place, while the reaction generally decreases in intensity in the direction of the outlet of the gas.

Compact iron, such as waste or filings, is little suited as contact substance for the process, but iron oxide, either artificial or natural, *e. g.*, iron oxide clay briquettes or iron ore, are eminently suitable. All these substances become more or less porous during the reducing process.

Theoretically speaking, the contact mass could be used over and over again indefinitely in accordance with the before mentioned formulæ, so that an unlimited quantity of hydrogen could be produced by means of a limited quantity of contact mass.

In practice, however, a limit is placed to the life of the contact mass by the fact that as it is only the surface of the latter that is being acted on, the substance gradually becomes impregnated by the dust, silicic acid and sulphides liberated by the gases. These impurities form a layer on the surface, diminishing the reacting capacity, so that the yield of hydrogen is gradually lowered and other disadvantageous combinations take place.

It is necessary, therefore, to renew the contact mass periodically, say after the plant has been in operation for from 8 to 30 days.

The principal difficulty with the iron contact method arises from the fact that a considerable amount of heat is absorbed during the various stages of the process by the chemical reaction. It is therefore not easy to keep the contact mass at a correct temperature without overheating.

If overheated, the contact mass loses its porosity, cakes and even melts. This renders the replacing of the contact mass difficult or even impossible. The action of the gases becomes defective and the yield of hydrogen falls considerably, as channels and cavities are formed which can no longer be acted upon regularly by the gas and steam.

As the iron contact method is very old, all kinds of suggestions have been made in the course of time in connection with the practical method of dealing with this process.

A voluminous mass of patent literature on this subject is in existence. Only the most important of these patents, most of which have long ago expired, are here passed under review.

Giffard, who made the method public in 1878, may be considered the discoverer of the method. He employed a shaft filled with ore which he heated and reduced by means of gases coming from a

producer connected with the shaft and which passed through a dust chamber, in order to remove the particles of dust introduced during the operation. The defect of this system was that the ore was easily contaminated by the impurities contained in the gases and that a sufficiently high temperature could not be maintained.

In 1889 *Claus* (English Patent No. 50) published a method for the production of hydrogen in a shaft furnace. He too employed "porous though solid blocks of iron oxide" which he alternately reduced with water gas and oxidized by means of superheated steam.

Walker's English patent 8373, dated 1890, describes the operation of the contact method in iron retorts, which were heated in a retort furnace from the outside. He employed water gas for the reduction.

In 1892, the firm of *Krupp* published various improvements of the process (D. R. P. No. 73,978) which, however, did not produce satisfactory results and were ultimately rejected.

Iron ores were employed in heated shafts or retorts and attention was drawn to the importance of employing reducing gases as rich as possible in hydrogen with a minimum of hydrocarbon.

Stracke returned in 1893 to the Giffard shaft furnaces (German Patent No. 77,350) and filled a shaft furnace with layers of "iron, iron oxide and ore in any form," heating and reducing the whole by heated generator gas or water gas which he introduced through the ore from the generator. He used charcoal in the generator in order to avoid the formation of sulphur compounds while producing exceptionally pure gas. The waste gases formed during the process of reduction were completely consumed in a superheater with fire-proof cage-work which served to raise to a high temperature the steam used in producing the hydrogen. Here too the heating was insufficient.

Schimming took out a German patent No. 95,071 for the preliminary heating of the reducing gases which he achieved by blowing air into the reducing shaft in order to cause combustion of a portion of the reducing gas. This method had the grave defect of overheating and melting the ore at the entrance, while the ore further away was not sufficiently heated. He tried to remedy this defect by mixing pieces of fire brick with the contact mass in order that the former might retain a portion of the heat, but the system involved serious drawbacks.

Caro in German patent 249,269 tried to overcome the want of

uniformity in the heating by introducing air to the ore mass at various points during the reducing process. It is evident that under this system the reducing capacity of the gases was seriously affected, so that the yield of hydrogen was altogether too low.

Lewes's English patents 4134 and 20,752, dated 1890 and 1891, once more describe the iron contact method in detail. He proposed to lay a retort with iron contact mass directly through a water gas generator, which was technically hopeless owing to the consequent overheating. He proposed for the first time to employ porous briquettes made of iron oxide and clay or asbestos and then pressed and burned. He employed water gas for reducing, justly pointing out that the use of such gas rich in hydrogen greatly accelerated the process of reduction.

Hills describes in his English patent 10,356, dated 1903, the production of hydrogen by the iron contact method, which he proposes to carry out in iron retorts. Unimportant improvements in the apparatus employed in the already well known process were patented by him. He used water gas for the reducing process.

Elworthy, in German patent 64,721, dated 1905, discusses the contact method exhaustively. He notes as the chief defects the tendency of the mass to melt and the choking of the retorts. He proposes to overcome this difficulty by using furnaces in which the spongy iron is contained in specially constructed fireclay holders. The use of iron in lumps of varying size is taken for granted. By "iron" he always means spongy iron produced by reduction from iron oxide or iron ore, as, he explicitly states in his English patent 12,461, dated 1902, he employs water gas for the reducing process.

Lane repeatedly constructed installations in Russia, France and England about 12 to 14 years ago on the iron contact method. He used chiefly briquettes similar to those suggested by *Lewes*, made of iron oxide and clay which were reduced by water gas in iron retorts, in large iron retort furnaces. The installations proved, however, to be of inferior working capacity, as in the case of the proposals made by *Walker* (1890) and *Hills* (1903), and were nowhere a success.

The International Hydrogen Company, whose shares are held by the Berlin Anhalt Machine Construction Company of Berlin, there-upon "discovered" the identical method for the hundredth time. The result was the same as in all other previous cases.

The inevitable difficulty of the retort system lies in the fact that

the retorts are destroyed by fire after being a short time in operation (about six weeks) besides being choked by the ore.

In a large installation now in operation every charge for the 32 retorts for two furnaces with a capacity of 100 cubic meters costs about \$3,000.

As these retorts produce 100,000 cubic meters before being rendered useless by fire, one cubic meter of hydrogen costs for the replacing of retorts alone $\$3,000 \div 100,000 = 3$ cents. Apart from the high cost of production involved in the production of hydrogen by the retort method, other drawbacks, such as continuous repairs, loss of hydrogen by waste, interruption of operating plant, excessive, unbearable heat, and early destruction of the furnaces are so serious that the system is not to be recommended.

The mere fact of the imperfect preparedness for operation makes it unsuitable for airship purposes, as the furnaces have to be heated gradually for several days before they begin to produce gas. The heating of the retort furnaces entails the use of a special system of coke firing, built in the retort furnaces, and involves the use of a considerable amount of coke (about 1,200 to 1,500 kilos per furnace daily).

The oldest system employed by Giffard, already referred to, undoubtedly possessed important advantages over this system, but the difficulty of heating was a very serious one, as is shown by the above mentioned extracts from the patent literature on the subject.

Recently, however, after exhaustive experiments many of the difficulties connected with the rational carrying out of the iron contact method in large industrial plants have been to a great extent overcome by the vertical cylinder process and installations.

The method has now been so much improved by the application of entirely new principles that it meets to a certain extent the requirements of a process adapted to large installations, such as rapidity in getting the plant into working order, more certainty of operation, and simplicity. The vertical cylinder generator is distinguished by separate heating and contact chambers communicating with each other. The former serve for the uniform heating of the contact mass, as well as for the super-heating of the steam. The heating takes place at intervals, yet it is continuous, because when the heating is discontinued, the super-heating maintains the temperature of the contact chamber by its radiation and continues to heat the contact mass.

The application of this principle explains the high generating capacity of this type of generators.

Owing to the separate chambers, the vertical cylinder generators may further be heated directly by the still combustible waste gases liberated during the reducing process. They require, therefore, no expenditure for heating material or special heat generators with workmen in attendance, as they are self-heating. This gives some advantage of an economy hitherto unattained. Losses of hydrogen, such as are inevitable by the retort process, are avoided by the use of the vertical cylinder type of generators, as no glowing particles of iron peel off the exterior of the apparatus, under pressure, owing to the generator being lined with fireclay.

Necessary repairs can be executed in a few hours without any lengthy interruption of work, as the inner parts can be easily withdrawn and replaced by a block and pulley arrangement. Any kind of reducing gas may be used in the vertical cylinder system of generators but it is best to employ water gas or half water gas.

A special arrangement further renders it possible to heat the contact mass, both directly and indirectly during the reducing process by means of which uniform heating is secured.

Many of the defects incident to former installations are avoided in the vertical cylinder system by replacing the contact mass in comparatively narrow circular layers which also secures uniform heating, reduction and oxidation by the corresponding streams of gas.

Giffard suggested ore as a contact mass. When properly treated, specular iron ore, red hematite and iron oxide hydrates have generally been found suitable. The use of purple ore was protected by patent 220,889 and that of sparry iron ore by patent 241,669 (dated 1911). The former has the disadvantage of containing too much sulphur and cakes easily, while the latter often melts too easily.

Their use, therefore, offers no advantages. As a rule briquettes act too slowly, owing to their defective porosity.

According to German patent 244,732 taken out by the International Hydrogen Company, spongy iron free from carbon can only be produced by reduction and out of it pure hydrogen, when instead of the usual water gas, a gas consisting chiefly of hydrogen, but absolutely free from hydrocarbons, is employed.

In practice this assertion has not been found to be warranted. Besides, the fact is unimportant, as there exists no practical method of producing such a gas.

The Badische Aniline & Soda Manufacturing Company has even admitted in a recently announced patent that a spongy iron produced by a reduction from iron ore by means of coal in Sweden for smelting purposes is suitable for the preparation of hydrogen.

Experts have long been aware that the maintenance of a proper temperature is indispensable for the production of spongy iron free from carbon. If this is done, any reducing gas, even pure carbonic oxide, may be used for reducing, but water gas has the advantage of acting more quickly, as has been decided by experts who investigated the matter several decades ago.

Many defects of the iron-contact method for production of hydrogen have been overcome in recent years, but there still remain further refinements to bring the process to its highest efficiency.

INVESTMENT IN MINES.¹

It is quite probable that most of the people who buy shares in the stocks of mining companies do not care whether the mines are good or bad. Their money is put on the cards with certain mining names and they occasionally win, and often lose, with the rise and fall of the markets. The extraordinary feature of this game is that the more money the dealer collects in his pile, which of course is taken from them, and the richer he gets, the more confidence they have in him and the harder they play.

If it had been customary for the land to be tilled by agricultural companies incorporated under the Joint Stock Companies Act the names of such companies might have been substituted for those of mining companies, and any disrepute which might have been attached to the one name might have been transferred to the other. So that for any disrepute that the mining industry has, the Joint Stock Companies Act and not the mines are largely responsible.

I have nothing to say to such gamblers. They should be handed over to their clergymen for curative moral and religious treatment.

But there are men in the community who are interested in the development of the mining resources of the country, and who are prepared to follow their interest with some of their money. To such men a few remarks may be of interest.

First, let them disabuse their minds of the idea that mining is any

¹ Reprinted from the *Canadian Mining Journal*, 1917, p. 110,

sort of a game, to be played either over the table or out of doors. It is not an amusement or recreation or dishonest mode of making a living; but it is a serious calling and must be contemplated seriously if it is to be successful. The work may be pleasant or enjoyable, as any good successful work should be, whether that work is mental or physical; but it is none the less strenuous on that account.

Everyone will of course recognize that the actual supervision and operation of mines is serious and strenuous work, but many think that the investment of money in these same mines is gaming. This may be true or untrue, just as one may see fit to make it.

If the purchaser is willing to take the trouble to be an investor, and not a gambler, in mining stocks he must exercise the ordinary precautions that he would take if he were to put his money into any other business enterprise. He must remember that a mine, in whatever stage of its development, is a natural feature which embraces a definite portion of the earth's crust, and that it can be examined and valued by those who are accustomed to perform such work, just as a house or garden or farm can be valued, and that the men who invest on the advice of such valuers are reasonably certain to make good profits on their investments.

Most men who buy stock in mining companies buy on the advice of men interested in selling stock to them. The sellers may be quite honest, and their opinions may be backed up by those of others who are also honest, but nevertheless it is the duty of an intelligent business man to inspect what he buys, or to get some competent person in whom he can place confidence to inspect it for him, whether the object is a mine, a timber limit, a farm, a horse, or whatever it may be. If he does not have such inspection made he deserves to lose his money. Some people may argue that opportunities for good investments in mining properties are seldom offered, and when offered must be seized quickly or they will be snatched up by others. Take your time, and if a man tries to hurry you into a quick purchase without sufficient time for careful examination, no matter what pretext he may offer for the shortness of time at his disposal, refuse to do business with him; you will save money in the long run.

It may also be thought that it is almost impossible to make favorable investments in good mining properties or in stocks of good mining companies on account of the keen competition for such investments. But competition to be effective must be intelligent, and most of the so-called competition is neither the one nor the other. Unin-

formed buying is no competition to the careful business man; but on the contrary it often gives him an opportunity to secure bargains which he would not be able to get if other buyers were not wasting their money on trash. The purchaser of a mine or of mining stock, who purchases without knowledge or competent and independent advice, is not a formidable competitor to the man who knows thoroughly what he is purchasing. In spite of the wails and protests of those who have lost money by buying pieces of paper which they were gullible enough to believe would soon represent wealth to be derived from new mines, I have no hesitation in saying that at the present time investments in mines, if made intelligently and on competent and independent advice, will yield larger and more certain returns than investment in any other class of securities on the market.

There may be some timid mining engineers who will say that they do not invest any money that they may possess in mining securities. Such engineers must be avoided as financial advisers. If they have not sufficient confidence in their knowledge and ability to separate good mines from bad ones, and to stake their own money on that knowledge, you may take it for granted that they are not capable of judging of the value of mines in which others should invest. But there are engineers who make a study of the value of mines, and who are not afraid to put their money into them. The advice of such men will usually lead to successful investments. It may have nothing to do with the vagaries of the stock market, and it is rarely that a purchaser will buy on such advice stock which is selling at \$2.00 to-day and which will be selling at \$4.00 to-morrow, but he will buy stock in mines which have intelligent, honest directors, are well managed, have large ore reserves, and are certain to pay good dividends for years to come.

If the capitalist has money to spare, and wishes to take long chances in the hope of larger returns, he may be directed to buy stock or interests in mining properties in their early stages of development which have good prospects of becoming dividend payers, and he will be directed to avoid the many properties, no matter how glaringly advertised, which have no such prospects. In the case of such speculative purchases no advising engineer of any reputation or standing will guarantee success, but he will increase the chances of success manyfold.

Such speculative purchases are the ones usually thought of when men talk about "putting their money into mines," and the successes

that have fallen to the lots of the fortunate speculators have laid the foundations for many an attractive story. If a man wishes to speculate, let him do so, but let him be sensible and reduce the chances against himself as much as possible before he pays over his money. He should not accept a seller's statement that a hole in the ground, whether large or small, is of any value as a mine until he has taken the trouble to examine it for himself or has had it examined by some competent and independent valuator.

I have attempted briefly to draw attention to an ordinary business principle in common use among people everywhere throughout the country. If it is kept as constantly in view when mines, or interests in mines, are being purchased, as it is in other commercial transactions, we will soon hear less of the losses incurred in the purchase of worthless mining stock.

BOOK REVIEWS.

PRINCIPLES OF PHARMACY, by Henry V. Arny, Ph.G., Ph.D., F.C.S., Professor of Chemistry in the College of Pharmacy of Columbia University. Second edition, revised, with 267 illustrations. Octavo, cloth, 1056 pages. W. B. Saunders Co. \$5.50 net; half morocco, \$7.00 net.

Writers of textbooks on extensive subjects such as pharmacy, like editors of journals, are not confronted with the necessity of searching for material but must rather solve the difficult task of separating the essentials from the non-essentials. Professor Arny has, in his textbook, picked the wheat from the chaff with a skill that can only be acquired by long teaching experience and intimate contact with the pharmaceutical problems of the day.

The book is divided into seven parts. Part one deals with pharmaceutical processes and the arithmetic of pharmacy in a refreshingly concise yet understandable manner. Only sample problems are given in the section devoted to arithmetic, so that a textbook or class room problems on this subject are needed to supplement this chapter.

Part two deals with the galenical preparations of the pharmacopœia and those unofficial preparations considered worthy of notice. The numerous tables classifying these preparations as regards strength, method of manufacture, etc., are invaluable to the student

in summarizing the knowledge which has been imparted through lectures and book study.

Part three takes up the inorganic chemicals used in pharmacy and includes a discussion of chemical theories and chemical arithmetic.

The organic chemicals used in pharmacy are taken up in part four. The comments on individual compounds are preceded by an introductory chapter dealing with the theory and classification of organic compounds.

The analytic methods of the Pharmacopœia are summarized in part five and chemical testing is taken up in a manner which at once gives the student the proper point of view with regard to this phase of pharmaceutical work.

Part six takes up the prescription and valuable information regarding incompatibilities has been collected in this portion of the book.

Part seven consists of a set of laboratory exercises including problems in chemical arithmetic and equation writing. We should like to see this portion of the work extended sufficiently to fulfill the syllabus requirement for laboratory work in pharmacy.

A careful examination of the various chapters of the book shows that up-to-date information on many phases of pharmaceutical work has been included. For instance some space is devoted to a discussion of ampuls and methods of filling them. On the other hand, the subject of biological assaying, now recognized in the Pharmacopœia, is given scant attention.

Perhaps the greatest distinctive feature of this book is the excellent and extensive bibliography given at the end of each chapter. For student and teacher alike this is an invaluable asset and it alone makes the book a necessary addition to every working pharmaceutical library.

Just at this time, pharmacy is striving hard for the recognition it should receive from other professions and the government. In order to secure and hold such recognition it is necessary for pharmacy to demonstrate through its men and its literature that it is deserving of the prominent place which it craves.

Books like Arny's "Principles of Pharmacy" are a credit to the profession and will go far to give our craft the desired standing among the learned professions.

ROBERT P. FISCHELIS.

MATERIA MEDICA AND PHARMACOLOGY, a Manual comprising all Organic and Inorganic Drugs which are or have been official in the United States Pharmacopœia, together with the Important Allied Species and Useful Synthetics, by David M. R. Culbreth, Ph.G., M.D., Professor of Botany, Materia Medica and Pharmacognosy in the Maryland College of Pharmacy, Department of the University of Maryland, Baltimore, Md. Sixth edition, thoroughly revised, with 492 illustrations. Octavo, cloth, 1001 pages, price \$5.25 net. Published by Lea and Febiger, Philadelphia and New York, 1917.

This familiar textbook on material medica and pharmacology has been thoroughly revised to conform to the Ninth Decennial Revision of the Pharmacopœia, and also includes references to the important drugs and preparations now included in the National Formulary.

The arrangement of the drugs remains strictly the same as that followed in previous editions, being based upon the principle of associating as nearly together as possible those substances, organic and inorganic, which have a common or allied origin, allowing those next related to follow in regular order, the basal or parental source thus being kept paramount.

Dosage and measurements are given in both the English and metric systems. While this is undoubtedly a convenience to some, it is a disadvantage to the teaching of medicine and pharmacy in view of the propaganda favoring the use of the metric system only, in the compounding, prescribing and dispensing of medicines. The sooner authors of pharmaceutical and medical textbooks confine themselves to the use of the metric system the sooner will it be brought into universal use. The Pharmacopœia and National Formulary have both ceased giving quantities of ingredients in preparations and dosage in the apothecaries' system and writers of textbooks should follow this example.

We note that the abbreviation *Ml.* is used to express milliliter throughout this work, whereas the official substitute for *Cc.* is the coined work *mil.* From the teacher's point of view this is particularly unfortunate as it gives the student consulting the official works and this textbook an idea that any abbreviation will do, when all the energies of the teacher are bent toward uniformity in this respect.

In the table on page 945 under "Prescription Writing" the author gives *ml.* as the abbreviation for milliliter and *Ml.* as the

abbreviation for myrialiter. Yet on the same page we find the statement that a cube measuring .393 of an inch on the side "contains of distilled water 1 Ml. (Cc.) weighing 15.434 grains and this furnishes the unit of weight (gramme)." While a matter like this has no great bearing on the value of the book as a text of materia medica and pharmacology, it does present an inconsistency which should be avoided in a textbook.

A number of new illustrations have been added and these are undoubtedly of considerable value in elucidating the text.

One would rather expect in a work of this kind to find some reference to the newer methods of standardization, especially those mentioned in the Pharmacopœia under biological assays. In the discussion of cannabis, for instance, no reference is made to the physiological standard required by the Pharmacopœia.

The mechanical make-up of the book is good and on the whole its contents entitle it to a prominent place in our list of pharmaceutical textbooks.

ROBERT P. FISCHELIS.

THE PHILADELPHIA COLLEGE OF PHARMACY.

NINETY-SIXTH ANNUAL COMMENCEMENT.

The Commencement exercises of the Philadelphia College of Pharmacy extended from June second to June sixth. The baccalaureate services were held at the Church of St. Luke and Epiphany on Sunday, June 4, the baccalaureate preacher being Rev. Dr. David M. Steele. The sermon was based upon the text "How much is a man better than a sheep." The annual meeting of the Alumni Association was held on Monday afternoon. The Professors' Supper to the graduating classes was given in the Museum on Monday evening. Class Day exercises were held on Tuesday afternoon, June 5. The annual reunion of the Alumni Association was in the nature of a special entertainment followed by a dance. Owing to illness Dean Joseph P. Remington was unable to attend the exercises connected with Commencement and it is the ardent hope of the faculty, students and members of the College that he will soon return to the halls of the College.

The Commencement exercises were held on Wednesday evening,

June 6, at the American Academy of Music, when the diplomas and prizes were awarded to the members of the graduating classes and honorary degrees were conferred. The opening prayer was made by Rev. Frederick L. Sigmund, and an address was delivered by Mr. Edward J. Cattell. The degrees were conferred by President Howard B. French.

The following are the names of those receiving the degree of Master in Pharmacy (Ph.M.) *honoris causa*: Julius William Sturmer, Phar.D., William Baker Day, Ph.G., Frederick John Wulling, Ph.G., LL.D., John Karl Thum, Ph.G.

The degree of Master in Pharmacy (Ph.M.) *in course* was awarded Charles Elbert Hoffman, P.D., of the class of 1909 P.C.P.

The degree of Bachelor in Chemistry and Pharmacy (B.Sc.) was awarded for the first time upon Louis Gershenfeld, P.D., of the class of 1915 P.C.P.

The following are the names of those receiving the degree of Doctor in Pharmacy (P.D.) together with the subjects of their graduating theses:

Name	Thesis	
Adams, Ernest Watts	Application of Purity Tests ...	New Jersey
Adler, Rudolph Wolf	Chaulmoogra Oil	Pennsylvania
Banzhof, Harry George	Olive Oil	Pennsylvania
Beers, James Norman	Cold Creams	Pennsylvania
Boehme, Lawrence Karl	Cod Liver Extracts	Ohio
Bradburd, Harry Aaron	Industry of Chamois Skins ...	Pennsylvania
Brenner, Harry Ellsworth ...	Rheum	Pennsylvania
Brown, Barton Gerald	Gossypium Purification	New York
Brown, Leland Nelson	Cannabis, Its Cultivation	Delaware
Bucke, Samuel Lawrence ...	Elixir of Pepsin and Bismuth,	Pennsylvania
	N. F.	Pennsylvania
Calkins, Arthur Robert	Spiritus Ammon. Aromaticus..	Pennsylvania
Carroll, Paul Raymond		Pennsylvania
Clapham, Miss Amanda Elizabeth		Pennsylvania
Colestock, Chauncey Parven ..	Three Modified N. F. Prepara- tions	Pennsylvania
Cossoy, Herman Lincoln	The Vanilla Bean	Pennsylvania
Craft, Charles Clagett	Urine Analysis	Dist. of Col.
Cravens, John Coldsmith, Jr. (P.C.)	Castor-Jell	Pennsylvania
Croff, Adam Cleveland	Solution of Peptonate of Iron N. F.	Missouri
Davidson, Abraham (Ph.G.)..	Sulphur, Its Properties and Uses	New York
Dinklocker, Robert George ...	Sponges	Pennsylvania
Dohner, Harold Bertram	Santonica	Pennsylvania
Duster, Elmer Joseph	Microscopy of Morbid Urine ..	Pennsylvania
Ehman, Karl Francis (P.C.) ..	Glycyrrhizin	Pennsylvania
Ellis, Chester Alexander	Petrolatum Liquidum	Pennsylvania
Ellis, Wilbur James	Insect Powder	Tennessee

Ernest, Harold Langsdorf	Anesthetics	Pennsylvania
Evanson, Axel Alfred (Ph.G.)	Tests on Two Types of Chemical Disinfectants	North Dakota
Farrell, Robert Joseph	Characteristics of Urine	Pennsylvania
Fenstermacher, Clarence		
Hoover	Process for Extracting Gold by Potassium Cyanide	Pennsylvania
Foran, Ralph Richard	Superfluous Drugs	Pennsylvania
Forbes, William Clifford	The Sterilization of Hair and Shaving Brushes	Alabama
Frick, Charles Keyser	Fluorescence of Cathartic Drugs	Pennsylvania
Fuhr, Harry Godshall	Potassium Permanganate	Pennsylvania
Garrell, Frank Emanuel	The A. Ph. A. Recipe Book with Formulas for Toilet Creams	Pennsylvania
Gold, Martin Hollenbach	The Diatomaceæ and Other Organisms in the Philadelphia Water Supply	Pennsylvania
Grandy, Seth Parker (P.C.)	Influenza	Pennsylvania
Gross, George Richard	Disinfectant Value of Liquor Formaldehydi	Pennsylvania
Grove, Arthur Landis	The Manufacture of Intestinal Antiseptic Tablets	Pennsylvania
Hallman, Albert Jefferson	The Dangers Hidden in a Home Medicine Chest	Pennsylvania
Harrison, Thomas West		
Danville	Salvia	Pennsylvania
Harrison, Joseph Whipple		
Eugene	The Manufacture of Alkaloids by Lloyd's Reagent	New York
Hawbaker, Omar	Coriaria Myrtifolia	Pennsylvania
Hertzler, Norman Brubaker	Liniments, Involving Saponification	Pennsylvania
Hocker, Alvin Roy	The Microscopical Structure of Hyoscyamus Niger	Pennsylvania
Holloway, John Wilson		
(P.C.)	Greaseless Vanishing Creams	Pennsylvania
Huber, Hiram Franklin	Stock Preparation Costs	Pennsylvania
Huth, Harry Godfrey	Pharmaceutical Agitation	Wisconsin
Ibberson, Fred Earl	Calamine	Pennsylvania
Jones, Herbert Sight	Red Cabbage as an Indicator	Pennsylvania
Jordan, Herbert Victor		
(P.C.)	Sugar	Pennsylvania
Kane, Bernard	Phenol	Pennsylvania
Kapler, Amos William	The Tanning of Leather	Pennsylvania
Kelchner, Lawrence Samuel	Commercial Glucose	Pennsylvania
King, Jacob Harris (P.C.)	Filter Paper	Pennsylvania
Koch, Chauncey Astor	The Geological Formation of Sulphur and the Advancement in the Industry	Pennsylvania
Krauss, Edward	Japanese Aconite	Pennsylvania
Laucks, Frederick Scholl	Comparative Methods for the Assaying of Ipecac	Pennsylvania
Leibowitz, Jacob Louis	The Quantitative Separation of Strychnine and Brucine	Pennsylvania
Ligan, Robert Franklin (P.C.)	The Steel Industry	Pennsylvania
Lowther, Frederick Samuel	Salicylic Acid	Pennsylvania
McCann, Thomas Joseph	Soda Mint and Pepsin Tablets	Pennsylvania
McClure, Edward Everett		
Powell	The Determination of Phosphoric Acid	Pennsylvania

McKeel, Charles Baynor	Products of Southern Pine	No. Carolina
Maier, Albert Thomas	Hydrogen Dioxide	New Jersey
Maust, Jonas Gilbert	Glycerole Hypophosphites Com- pound	Pennsylvania
Milner, Louis	Physiological Testing of Enteric Coating	Pennsylvania
Murray, Lindley Rhea	The Determination of Borax in Borax Soaps	Pennsylvania
Nace, Earl Gray	Toilet Waters	Pennsylvania
Nagle, Philip Eugene	Liquor Magnesii Citratis	Pennsylvania
Nelson, Carl Harold	Black Antimony	Pennsylvania
Newcomer, Leo L.	Colloidal Suspensions	Pennsylvania
Null, Harry Watson	The Commercialization of Oxy- gen	Pennsylvania
Parvin, Edwin Cyrus	Liquor Magnesii Citratis	New Jersey
Pittman, Gerald Sutvan	Face Powders	Pennsylvania
Powell, James Clayton	Alkali Lands	Pennsylvania
Pryor, Charles Taylor	The History of the Volatile Oils	Pennsylvania
Rex, Walter William	Logwood	Pennsylvania
Rodes, Harry Beard	Glycerite of Hydriodic Acid	Pennsylvania
Rosenfeld, Lawrence Marx	Cupri Sulphas	Pennsylvania
Rupp, Robert Adam	Moulds	Pennsylvania
Rupp, Walding George	Triticum	Ohio
Schoenthaler, Russell John	Acidum Hypophosphorosum	New Jersey
Shinn, Edward	Cultivation of Medicinal Plants	Illinois
Shoop, James Harper	The Drugs Affecting the Urine and Urinary Apparatus	Pennsylvania
Siegfried, Charles Francis	Tincture of Nux Vomica	Pennsylvania
Skeath, Alexander Hamilton Butler	Acetic Acid	Pennsylvania
Snyder, William Henry (P.C.)	Production of Industrial Alco- hol	Pennsylvania
Sutton, William Henry, Jr.	The Chemistry of Low-Freezing Brines	New Jersey
Thomas, John Carter	Home Manufacture and Uses of Unfermented Grape Juice	Delaware
Wagner, Raymond Charles Bernard	The Manufacture and Uses of Serums, Bacterins and Vac- cines	Pennsylvania
Webster, Leslie Sharpless	Saturated Solution Boric Acid	Pennsylvania
Wishniefsky, Harry	Caffeine, Theobromine and Theo- phylline	New Jersey
Zercher, Charles Stanley	Aromatic Waters	Pennsylvania
Ziegler, Paul Fleager	Commercial Cleaning Fluids	Pennsylvania

The following graduates were awarded the degree of Pharma-
ceutical Chemist (Ph.C.):

Angstadt, Harry Franklin	Pennsylvania
Brosius, George N.	Pennsylvania
Buchman, Evan	Pennsylvania
Frederick, Charles R.	Pennsylvania
Heine, Edward	Pennsylvania
Jones, Chester Kimmerer	Pennsylvania
Persing, William E.	Pennsylvania
Woehrle, Paul Philip	Pennsylvania

To the following graduates the degree of Pharmaceutical Chemist (P.C.) was awarded together with the subjects of the theses submitted:

Name	Thesis
Brown, Paul Revere	The Value of Pharmacognosy to the Retail Pharmacist Pennsylvania
Costello, Miss Genevieve	
Marie	Vanilla Pennsylvania
Devitt, John	Digitalis Pennsylvania
Duron, Guillermo Enrique ...	Capsicum Pennsylvania
Heckman, Paul Willard	Some of the Lotions Suggested for the Recipe Book of the American Pharmaceutical Association Pennsylvania
McNelis, Miss Anna Camillus.	Ampoules Pennsylvania
Mulford, Henry Kendall, Jr...	The Deterioration of Digitalis.. Pennsylvania
Richman, Samuel Thompson..	The Histology of Two Spurious Cubebs New Jersey
Sister Mary Beatrice	Pilocarpus Pennsylvania
Sister Mary de Chantal	Incompatibility Pennsylvania
Smith, Donald Benner	Hair Dyes and Color Restorers. Pennsylvania
Steinsnyder, Barnett	Benzinum Purificatum New York
Stickle, Morton Donaldson ..	Sterilization of Camphorated Oil. Honduras
Tyson, Jacob Homer	Nature's Methods of Seed Dissemination Pennsylvania
Way, Miss Helen	Organotherapy New Jersey

The degree of Graduate in Pharmacy (Ph.G.) was awarded the following graduates:

Name	Thesis
*Abalo, Aristides	Cuba
*Adams, Elwood C.	Pennsylvania
*Ahrendts, Conrad Henry	Pennsylvania
Anderson, James Philip	Spiritus Aetheris Nitrosi Ohio
*Ashcraft, Bernard Alfred ...	Pennsylvania
Bambrick, Martin Joseph ...	Petrolatum Pennsylvania
Baron, Samuel	Theobroma Cacao Pennsylvania
*Beckett, Thomas Aloysius ...	Pennsylvania
Bienstock, Nathan Samuel ..	Retail Pharmacy Advertising .. Connecticut
Bohn, Frederick Henry	Soda Foam Producers New Jersey
Bowman, Walter Jennings ..	Pill Excipients Pennsylvania
Bowron, Dilley Arthur	Sterilization Ohio
Brodman, Mrs. Bessie Liss ..	Hydrogen Dioxide in Mixtures. Pennsylvania
Buckwalter, Clarence Clifton.	Stramonium Leaves Pennsylvania
Burbage, George Andrew	Sterilization Maryland
Carter, William Baker	Veterinary Preparations Pennsylvania
Carter, William James	Nux Vomica Pennsylvania
Clarke, Ray Shearer	Commercial Colloidal Silver .. Pennsylvania
Cole, Charles Woodson	Assaying of Magma Magnesia.. Pennsylvania
Cooperman, Daniel	Merchandising Maryland
Cribbs, Frank Albert	Preservation of Volatile Oils .. Pennsylvania
*DeBlasio, James John	Pennsylvania
Devers, Miss Margaret	Maize Oil Pennsylvania
*Dunston, William Harold	Pennsylvania

* Thesis not required.

- Evans, Hunter Leon Tincture of Strophanthus Pennsylvania
 *Folk, Howard George Pennsylvania
 Foust, Clarence Herr Glycyrrhiza Pennsylvania
 Frazer, Donald Morrow Prescription Dispensing—Pow-
 ders Ohio
 Fundora, Florentino Lope ... Tincture of Iodine Cuba
 Gardner, Stanley Preston ... The Arsenic Test of the U. S. P. Pennsylvania
 *Garr, Hyman David Pennsylvania
 Gehman, Walter Warren ... Decolorized Tincture of Iodine. Pennsylvania
 Gershenfeld, Joseph Charles. Coconut Oil Pennsylvania
 Griesing, Howard William .. Ambrine Pennsylvania
 *Hacker, Raymond Colby Ohio
 *Hafer, LeRoy Irvin Pennsylvania
 Haldeman, Glenn Arthur Intestinal Antiseptics and Dis-
 infectants Ohio
 *Hall, Edward Willard Pennsylvania
 Hamilton, David Ambrose, Jr. Honey and Its Uses in Phar-
 macy Pennsylvania
 Hammill, Arthur Vincent
 Francis Drug Store Advertising Pennsylvania
 Heath, Raymond George Commercial Papain Pennsylvania
 Helnore, John Charles New Mercurial Preparations .. Wisconsin
 *Hernandez, Antonio
 Alejandro — Mena Kaolin, Relation to Diphtheria
 Bacillus Growth Cuba
 Imler, Richard Monroe Liquid Petroxolin Pennsylvania
 Karn, John William Ampoules Wisconsin
 *Kelley, John Forrest Pennsylvania
 Knoepfel, Harry John Kieselguhr Pennsylvania
 Krechmer, Max Ellis New Kinds of Syphons New Jersey
 Langeluttig, Joseph Ellis Pennsylvania
 McCarney, Merle Assay of Lime Water Pennsylvania
 *Macias, Francisco P. Cuba
 Meagher, Matthew Clarence. Antiseptic Dental Cream Pennsylvania
 *Medvedkin, Jacob Louis Pennsylvania
 Meyers, Louis Fred Suppositories Pennsylvania
 Milburn, Arland Roland Sugar Cane and By-products .. Delaware
 Miller, Robert William Acidum Nitrohydrochloricum
 Dilutum Pennsylvania
 Mills, John Herman, M.D. .. Castela Nichelsoni, var. texana. Florida
 *Morgan, Thomas Asaph Pennsylvania
 Moyer, Raymond John Chemical History Pennsylvania
 *Moylan, Joseph Aloysius Pennsylvania
 *Mulherin, James Patrick Pennsylvania
 *Neff, Aaron Pennsylvania
 Nicholl, Elmer Thomas Window and Show Case Deco-
 rating Pennsylvania
 Nichols, Adley Bonisteel Terra Silicea Purificata Wisconsin
 *Potts, Earl Luther Pennsylvania
 Powell, Miss Edythe Bird .. Hydrogen Peroxide in Milk ... Pennsylvania
 *Ramirez, Jose — Flores Cuba
 *Reynes, Jose Santiago Cuba
 Rinn, Miss Hazel Marie Suppository Making Pennsylvania
 Rishton, Myron Parker Plantago Rugelii Pennsylvania
 Rodis, Louis Facts Regarding the Pennsylv-
 vania Pharmacy Laws and the
 Harrison Narcotic Law New Jersey
 *Ruff, Ulysses Gilbert, Jr. Pennsylvania
 *Schneck, William Owen Pennsylvania
 Schultz, Miss Anna L. Tooth Washes Pennsylvania

Seltzer, Robert Hood	Window Dressing	Pennsylvania
Shaak, John Franklin	Cotton Seed Oil	New Jersey
*Shaw, John Donald	Ethyl Chloride as a General and Local Anesthetic	New Jersey Ohio
Shaw, Neal Wendle	Medicinal and Other Soaps	Pennsylvania
Sherman, Alexander		Pennsylvania
*Shiley, Harry Allen		Russia
*Skloff, Myer		Russia
Smith, Miss Rose Frances ..	Pharmacognosy of Green Gin- ger and the Superiority of Preparations of the Fresh Drug	Pennsylvania
Steidle, Carl Frederick	Potassium Bromide	Pennsylvania
Steigrod, Harry Archie	Lime Water	Pennsylvania
	Solution Peptonate of Iron and Manganese	Pennsylvania
Sunday, Jesse Hartzell		Pennsylvania
*Tesman, Jacob		Pennsylvania
Thomas, Miss Bessie Estella	Dakin-Carrel Solution and Am- brine	Pennsylvania
Tuck, Henry Cornelius	Peppermint	Pennsylvania
Usher, William Francis	Iodine and Official Preparations ..	Pennsylvania
Wagner, Clarence Kinney ...	Zinc, Metallic and Oxide	Pennsylvania
Warricks, James Robert	Synthetic Oil of Bitter Almonds ..	Pennsylvania
*White, Ray Ellsworth		Pennsylvania
Young, Joseph Roy	Bacteriology in Pharmacy	Pennsylvania

The following students who have passed all Second Year Examinations and are eligible for the Degree of Ph.G. when the other graduation requirements shall have been met received a Certificate attesting to these facts.

Name	Thesis	
Barab, Harry	The Composition of Certain Face Powders	Pennsylvania
Bass, Albert Abe	Physiological Standardization of Digitalis	Pennsylvania
*Blumberg, Maurice		New Jersey
*Braker, Norman Clifton		Pennsylvania
*Braslavsky, Albert		Pennsylvania
Carroll, John Francis	Cork, Its Origin and Uses	Pennsylvania
Cotanch, James Gilbert	The Tryptic and Peptic Power of Elixir of Lactopeptine and Elixir of Digestive Com- pound	New York
Dabney, Maurice Benjamin ..	Vaccines, Serums and Other Biological Products	Pennsylvania
Di Silvestro, Miss Elisa	Vitamines	Italy
Dompf, Solomon Harry	Pepsin and Its Preparations ...	Russia
Dudley, Leonard Freeman ..	The Tinctures of the Eighth and Ninth Revisions of the U. S. P. New Hamp're	
Dunmire, Wilbert Jacob	Cost of the Tinctures of the N. F.	Pennsylvania
Edgar, Roy Alfred	Cream of Camphor	Pennsylvania
*Ettelman, Abraham Guedalyah		Pennsylvania

* Thesis not required.

Fox, Miss Bessie Carrie Belle. Albuminates and Peptonates ...	Connecticut
*Friedman, Charles Jonas	Pennsylvania
*Gehman, Matthew Stanley	Pennsylvania
*Herman, Abraham Lincoln	Pennsylvania
Hess, Claude Thomas Buttermilk	Pennsylvania
Hidlay, William Clair Deodorized Oleic Acid	Pennsylvania
*Hoffstein, Benjamin Herman	Pennsylvania
*Hotchkiss, Harry Edward	New York
*Hovsepian, Haig S.	Armenia
Hysore, Charles Alphenas .. Fat Free Galenicals	Pennsylvania
Jackson, Clifford Payne The Modification of Milk for Infants	Pennsylvania
*Klingaman, Claude Raymond.	Pennsylvania
Lehrfeld, Manuel Magnesium and Its Compounds.	Pennsylvania
Lippincott, Melcour Restore. The Purification of Fatty Oils.	New Jersey
Mackler, Miss Rose Magnesium Sulphate	New Jersey
*Miller, Earl Thomas	Pennsylvania
Schwartz, Harry Leet Effervescing Salts	Pennsylvania
*Snyder, Charles Asemowitz	Pennsylvania
Stapleton, Richard Michael. Coal and Its Marketing	Pennsylvania
Stoneback, William Jennings. Balsam Apple	New Jersey
Thorne, Miss Elizabeth Kathryne	Wild Beach Plums New Jersey
Unterberger, Louis	Manufacture of Paper Pennsylvania
Weir, William Partee Talc	Virginia
Wepfer, Emil Albert Trifolium Pratense	Wisconsin

Certificates of Proficiency in Chemistry were awarded the following graduates:

Coble, Charles L.	Pennsylvania
Sands, Paul D., P.D.	Pennsylvania

Certificates of Proficiency in the Food and Drug Course were awarded the following graduates:

Harvey, Gilbert Leon	Pennsylvania
Ottinger, Harry Philip	Virginia

Certificates in Bacteriology were awarded the following:

Name	Where From
Carbo, Pedro	Cuba
Coble, Charles L.	Pennsylvania
Day, John Frederick	Pennsylvania
Dickhart, Wallace H.	Pennsylvania
Flores, David	Cent. Amer.
Forbes, William Clifford	Alabama
Gross, George Richard	Pennsylvania
Henderson, Clarence Harry	California
Henning, Edward F., P.D.	Pennsylvania
Hernandez, Antonio — Mena	Cuba
Horton, James Stanislaus	Pennsylvania
Marxuach, Acisclo	Porto Rico
Menkemeller, William, Jr.	W. Virginia
Mulford, Henry Kendall, Jr.	Pennsylvania
Neiffer, Grover Wellington	Pennsylvania

* Thesis not required.

Norton, Charles	Pennsylvania
Ramirez, Hermogenes C.	Cuba
Reynes, Jose S.	Cuba
Rutter, Lee Deitrich, P.D.	Pennsylvania
Shaffer, James Walter, P.D.	Pennsylvania
Smith, Russell C.	Pennsylvania
Smith, Donald B.	Pennsylvania
Sorber, Benjamin A.	Pennsylvania
Stickel, Morton D.	New Jersey
Stoppel, Albert	Minnesota

AWARD OF PRIZES.

Doctor in Pharmacy (P.D.) Course.

The grade of distinguished was attained by Miss Amanda E. Clapham. The following graduates received the grade of meritorious: Lawrence Karl Boehme, Axel Alfred Evanson, Ph.G., Helen Way and Harry Wishnefsky.

The Materia Medica Prize, \$25, offered by Prof. Clement B. Lowe, for the best examination in Materia Medica, and in recognition of Materia Medica Specimens with a meritorious thesis, was awarded to Amanda E. Clapham, the following students receiving honorable mention in connection therewith: Abraham Davidson, Martin H. Gold, Walding G. Rupp and Helen Way.

The Microscopical Research Prize, a compound microscope, offered by Prof. Henry Kraemer for the most meritorious thesis involving original Microscopic work, was awarded to Martin H. Gold, the following receiving honorable mention: Leland N. Brown, Paul R. Brown, John Devitt, Guillermo E. Duron, Walter J. Ellis, Charles K. Frick, Thomas W. D. Harrison, Omar Hawbaker, Alvin R. Hocker, Edward Krauss, Samuel T. Richman, Walding G. Rupp, Edward Shinn and Sister Mary Beatrice.

The Dispensing Prize, \$20 in gold, offered by Prof. E. Fullerton Cook for the best examination in Operative Pharmacy and Dispensing, was awarded to Earl G. Nace, the following students receiving honorable mention: Ernest W. Adams, Adam C. Croff, Frank E. Garrell, Russell J. Schoenthaler, Charles F. Siegfried, Donald B. Smith and William H. Sutton, Jr.

The Maisch Botany Prize of \$20 in gold, offered by Mr. Joseph Jacobs, of Atlanta, Ga., for Histological Knowledge of Drugs, was awarded to Martin Hollenbach Gold, the presentation being made by Mr. George M. Beringer, Alvin R. Hocker receiving honorable mention.

The J. B. Moore Memorial Prize, a Troemner Agate Prescrip-

tion Balance, offered by the Reverend J. J. Joyce Moore in memory of his father, J. B. Moore, to the member of the third year graduating class presenting the best thesis representing original work in the Department of Pharmacy, was awarded to Rudolph W. Adler, the presentation being made by Prof. LaWall.

The Commercial Pharmacy Prize, \$20 in gold, offered by Prof. Joseph P. Remington to the graduate who passed the best examination in Commercial Pharmacy at the final examination for the degree, was awarded to Herbert S. Jones, the presentation being made by Dr. Adolph W. Miller, the following receiving honorable mention: Ernest W. Adams, Rudolph W. Adler, Lawrence K. Boehme, Paul R. Carroll, Amanda E. Clapham and Edwin C. Parvin.

The Instructors' Prize, \$20, offered by the Instructors of the College for the highest term average in the branches of Pharmacy, Chemistry and Materia Medica, was awarded to Amanda E. Clapham, the presentation being made by Prof. Stroup, the following receiving honorable mention: Rudolph W. Adler, Lawrence K. Boehme, Paul R. Carroll and Charles F. Siegfried.

The Pharmacy Review Prize, one year's membership in the American Pharmaceutical Association, offered by Prof. Charles H. LaWall for the best term work in Theory and Practice of Pharmacy, was awarded to Walding G. Rupp, the following receiving honorable mention: Lawrence K. Boehme, Ralph R. Foran and Harry Wishniefsky.

The Kappa Psi Fraternity Prize, a gold medal, offered by the Eta Chapter of the Kappa Psi Fraternity to the graduate making the highest general average during the three years' course at the College, was awarded to Lawrence K. Boehme, the presentation being made by Mr. Harry K. Mulford, the following receiving honorable mention: Amanda E. Clapham, Ralph R. Foran, Herbert L. Jones, Helen Way and Harry Wishniefsky.

Graduates in Pharmacy (Ph.G.) Course.

The grade of distinguished was attained by Matthew C. Meagher, and the following graduates merited the grade of meritorious: William J. Carter, Margaret Devers, Donald M. Frazer, Howard W. Griesing, John H. Mills and Rose F. Smith.

The William B. Webb Memorial Prize, a gold medal and certificate, offered for the highest general average in the branches of Committee, Operative Pharmacy and Specimens, was awarded to William P. Weir, the presentation being made by Mr. Warren H.

Poley, the following receiving honorable mention in connection therewith: Frederick H. Bohn and Charles A. Hysore.

The Microscopical Research Prize, a compound microscope, offered by Prof. Henry Kraemer for the most meritorious thesis involving original microscopic work, was awarded to Rose Frances Smith, the following graduates receiving honorable mention: John H. Mills, William J. Stoneback, Elizabeth K. Thorne and Emil A. Wepfer.

The Operative Pharmacy Prize, \$20 in gold, offered by Prof. Joseph P. Remington for the best examination in Operative Pharmacy, was awarded to James G. Cotanch, the presentation being made by Prof. Samuel P. Sadtler, the following students receiving honorable mention: Harry Barab, Claude R. Klingaman, Melcour R. Lippincott, George McCrea Miller, Neal W. Shaw and Harold F. Staub.

The Mahlon N. Kline Theoretical Pharmacy Prize, a Troemner Agate Prescription Balance, for the best examination in Theory and Practice of Pharmacy, was awarded to Rose Frances Smith, the presentation being made by Mr. Joseph W. England, the following students receiving honorable mention: Donald M. Frazer, Elmer T. Nicholl and Edythe B. Powell.

The Commercial Pharmacy Prize, \$20 in gold, offered by Prof. Joseph P. Remington to the graduate who passed the best examination in Commercial Pharmacy at the final examination for the degree, was awarded to John H. Mills, the presentation being made by Dr. Robert P. Fischelis, the following students receiving honorable mention: Nathan S. Bienstock, William J. Carter, Donald M. Frazer, Howard W. Griesing and Charles Hysore.

The Instructors' Prize, \$20, offered by the Instructors of the College for the highest term average in the branches of Pharmacy, Chemistry and Materia Medica, was awarded to Merle McCarney, the presentation being made by Dr. Alfred Heineberg, the following students receiving honorable mention: William J. Carter, Howard W. Griesing and Matthew C. Meagher.

The Pharmacy Review Prize, one year's membership in the American Pharmaceutical Association, offered by Prof. Charles H. LaWall for the best term work in Theory and Practice of Pharmacy, was awarded to Howard W. Griesing, the presentation being made by Dr. Charles E. Vanderkleed, the following receiving honorable mention: Margaret Devers, Elisa di Silvestro, Hyman D. Garr and Merle McCarney.

OBITUARY.

JULIUS OTTO SCHLOTTERBECK.¹

Julius Otto Schlotterbeck was born in Ann Arbor in 1865. After attending graded and high schools in that city, he entered the University of Michigan, from which he was graduated with the degree of Ph.C. in 1887. One year later he was made assistant instructor in pharmacognosy and pharmacy in the university. In 1891 he was made assistant instructor in pharmacy and was granted a B.S. degree. From 1893 to 1895, he filled this position, after which he spent two years in the University of Berne, Switzerland, graduating *summa cum laude* in 1897 with the degree of doctor of philosophy.

He returned to the University of Michigan immediately after, accepting the position of assistant professor of pharmacognosy and pharmacy, which he held until 1904, when he was made professor of these studies. In 1905 he was appointed dean of the college of pharmacy by the board of regents.

Dr. Schlotterbeck created an enviable reputation as a scientist by discovering several vegetable alkaloids. For nearly twenty-five years he was associated with Frederick Stearns & Company as consulting expert and he had been a member of the firm of the J. Hungerford Smith Company. He was a member of the committee of revision of the United States Pharmacopœia, a (fellow) member of the American Association for the Advancement of Science, a member of the American Pharmaceutical Association, former secretary and president of the Conference of Pharmaceutical Faculties, a member of the American Chemical Society, was prominently associated with the Detroit branch of the American Pharmaceutical Association and former president of the Michigan State Pharmaceutical Association. He was a frequent and valued contributor to leading scientific journals and had published many important papers, possibly a majority on phyto-chemistry.

Dean Schlotterbeck is survived by the widow, Mrs. Eda C. Schlotterbeck, and three children; Prescott, nineteen, a freshman in the literary college of the University of Michigan; Miriam, sixteen, a high school student, and Carl, seven.

¹ A tribute to the memory of Dr. Schlotterbeck by Frederick Stearns & Company, with whom he was associated as consulting expert chemist for a quarter of a century.

Funeral services were held from the late residence, at 1907 Washtenaw avenue, Ann Arbor, Sunday, June 3. Interment was in Forest Hill Cemetery, Ann Arbor.

Just at the noontide of his life, when his brilliant pharmaceutical ability had become universally recognized, with well-earned honors accumulating more and more rapidly, his children budding into young manhood and womanhood and his host of friends ever widening and becoming more endeared to him, Dr. Schlotterbeck was summoned to the Final Analysis.

In the crucible of life must be compounded both joy and sorrow, love and loss. So all must feel who knew him.

To associate with Dr. Schlotterbeck was always a pleasure and a gain. His friends of classroom, post college days, scientific societies and among the pharmaceutical manufacturers considered it ever a pleasure to cultivate his society and learn from the precepts emanating from his masterly mind.

His departure left a sense of vacancy, realization that an exceptional teacher, a profound scientist and an admirable man had left an empty chair.

Probably no characteristic of this man—called after five months of almost continued suffering, from laboratory and friend and hearth and classroom to that land from whose bourne no traveler returns—stood out in more bold relief than loyalty.

And not only was he loyal in every deed and thought, but he engendered the spirit of this quality in all with whom he came in close contact.

The faculty and students of the University of Michigan ever took pride in asserting their staunch loyalty to this man of science and thousands will always be loyal to his memory as they meditate on the rude stroke of the reaper, which cutting down this virile life at its zenith also struck heart blows felt from farm to teeming metropolis, from desert span to ocean waste.

Dr. Schlotterbeck was a home man—the passion of science never built a barrier between him and his fireside.

Platitude and epigram anent the passing of the loved and lost from the fertile valley of life, beyond the barren great divide of eternity, find no place in a memorial to Dr. Schlotterbeck; his loss calls from every member of his great family of students, coworkers and friends a spontaneous tribute. And that tribute in tears, in words, and in thought, is paid by all those who knew him well.

It is as if the Master Pharmacist had emptied a vial of sorrow into the graduate of their lives.

Dr. Schlotterbeck possessed faith and vision—the work which he accomplished will live long years after dust has returned to dust.

Ability, loyalty, faith and vision, these were the outstanding traits of his character. These he defined in his daily work, he lived them and inspired others to live them. Through his loyalty, vision and ability he made better men and women and better pharmacists by his faith in man and in pharmacy.

The work of Dr. Schlotterbeck is bequeathed as a rich heritage to those wherever they may be, who have worked with him and learned to know and therefore to admire him.

PHARMACEUTICAL MILITARY ASSOCIATION ORGANIZED.

The first step in what promises to be the most active campaign yet undertaken for obtaining recognition for pharmacists in the Army and other branches of the government service was taken at a meeting of the allied pharmaceutical bodies of Philadelphia held at the Philadelphia College of Pharmacy, Monday evening, June 26th, 1917. A permanent organization was formed with Mr. George M. Beringer president, and Robert P. Fischelis secretary-treasurer. The Association will be known as the Pharmaceutical Military Association. An Executive Committee consisting of the following members of the various associations represented was appointed by the president: J. W. England and Walter B. Smith of the Philadelphia Drug Exchange; Ambrose Hunsberger and Eugene G. Eberle of the Philadelphia Branch of the American Pharmaceutical Association; Samuel C. Henry and J. C. Peacock of the Philadelphia Association of Retail Druggists, Henry Kraemer and Robert P. Fischelis of the Philadelphia College of Pharmacy; Dr. W. D. Robinson and Mr. George M. Beringer, *ex officio*. This committee is to co-operate with the Committee on War Defense of the Pennsylvania Pharmaceutical Association, consisting of Dr. F. E. Stewart, chairman, Professor J. A. Koch, Louis Frank, J. W. England and John K. Thum. Future meetings of the association will be held at regular intervals and immediate steps will be taken to get in touch with the proper government authorities to further the objects of the association.

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AUGUST, 1917

THE STABILITY OF IODINE OINTMENTS

By L. E. WARREN, Ph.C., B.S.

(CONTRIBUTION FROM THE AMERICAN MEDICAL ASSOCIATION CHEMICAL
LABORATORY.)

In general, the literature on the keeping qualities of iodine ointment, and on the stability of iodine if mixed with ointment bases, is confusing. The recorded evidence is often contradictory. The attention of the writers was brought to this condition by studies of several proprietary preparations, Iodex,¹ Iod-Izd-Oil,² Iocamfen,³ and Iocamfen³ Ointment.

Iodex was sold under the claim that it is

"... an embodiment of vaporized iodine, in an organic base, reduced and standardized at 5 per cent. by incorporation with a refined petroleum product."

The exact composition of Iodex is a trade secret. Analysis showed that it contains petrolatum-like substances and combined iodine, the latter probably in combination with oleic acid. Tests for free iodine were made in five specimens of Iodex. In one of these no free iodine was present; in the others the merest traces were found.

Two years ago a preparation called "Iod-Izd-Oil" was examined. This was claimed to contain 2 per cent. of free iodine in liquid petrolatum. At the time of the examination the age of the preparation was not known, but it had been obtained just prior to the analysis, and was thought not to be very old. The analysis

¹ *Rep. Lab. A. M. A.*, 8, 89 (1915).

² *Rep. Lab. A. M. A.*, 8, 106 (1915).

³ *Rep. Lab. A. M. A.*, 9, 118 (1916).

showed that it contained but about 0.43 per cent. of iodine, all of which was in a free state. The fact that all of the iodine present was in the free state appeared to indicate that iodine is relatively stable in liquid petrolatum solutions.

Iocamfen is a liquid composed of iodine, camphor and phenol. It was claimed to contain 10 per cent. of free iodine. Analysis showed that it contained 9.3 per cent. of total iodine (of which 7.5 per cent. was present in an uncombined state), 66.1 per cent. of camphor and 19.7 per cent. of phenol. After storing for several months a second assay of Iocamfen showed no appreciable loss in iodine content. This would indicate that iodine is relatively stable in presence of phenol and camphor, although immediately after mixing there is some loss of free iodine. The Iocamfen Ointment was supposed to contain 50 per cent. of Iocamfen (equivalent to 5 per cent. of free iodine) in a lard-wax-cacao-butter base. The analysis showed that the ointment contained but 0.4 per cent. of free iodine, the balance being in combination. From the results of the examination, and from correspondence with the manufacturers (Scher-ing and Glatz), it became evident that the only plausible explanation for the loss of free iodine in the preparation of Iocamfen Ointment from Iocamfen lay in the combination of the free iodine with the ingredients of the ointment base. It seems likely that the free iodine originally present in Iocamfen for the most part had gradually gone into combination with the fatty substances after the ointment had been prepared.

The literature was then examined to determine the consensus of opinion concerning the stability of iodine in iodine ointment. In the older literature the belief that iodine ointment is unstable appears to be quite general. Such statements as the following are typical:

The ointment should be prepared only when wanted for use, for it undergoes change if kept, losing its deep, orange-brown color, and becoming pale upon its surface.⁴

It is better to prepare it only as it is required for use.⁵

This ointment must not be dispensed unless it has recently been prepared.⁶

In 1909 Lythgoe,⁷ of the Massachusetts Board of Health laboratory, reported an examination of four samples of iodine ointment.

⁴ U. S. Disp., ed. 19, p. 1315.

⁵ Am. Disp., ed. 2, p. 2022.

⁶ U. S. Pharmacopeia, IX, p. 481.

⁷ *Rep. Mass. Bd. Health*, 41, 477 (1909).

Three were found to be pure, the fourth was low in iodine. Experiments showed that iodine ointment deteriorates rapidly; consequently, no further collections of samples were made.

In 1912 Pullen^s reported that he had prepared two specimens of iodine ointment according to the British Pharmacopeia, one being from new lard and the other from a specimen of lard at least two years old. Assays for free iodine were carried out immediately after the preparations were made, and at intervals afterward up to four months. The following values were found:

	Sample I. Ointment from new lard, Per Cent.	Sample II. Ointment from old lard, Per Cent.
Iodine introduced	4.0	4.0
Iodine found immediately after making	3.95	3.38
Iodine found after twenty-four hours	3.30	3.15
Iodine found on the third day	3.18	2.62
Iodine found on the seventh day	3.15	2.46
Iodine found on the fourteenth day	3.00	2.45
Iodine found after one month	3.00	2.39
Iodine found after two months	2.90	2.31
Iodine found after four months	2.92	2.26

Pullen found that the loss in free iodine could be accounted for by the iodine which had gone into combination with the fats of the ointment base.

Pullen also found that if the potassium iodide and glycerin were omitted in the preparation of the ointment, the loss in free iodine was very rapid, the preparation containing practically no free iodine (only $\frac{1}{20}$) after a few hours. He concludes that the use of potassium iodide and glycerin is necessary for the preservation of the ointment. He obtained specimens of iodine ointment in drug stores, and assayed them for free iodine. It is to be presumed that the ages of the several specimens were not known. The results are found in the following table:

Specimen No. 1	2.74 per cent.
Specimen No. 2	2.85 per cent.
Specimen No. 3	2.62 per cent.
Specimen No. 4	2.48 per cent.
Specimen No. 5	2.53 per cent.
Specimen No. 6	2.79 per cent.

^s *Pharm. Jour.*, 89, 610 (1912).

Fried⁹ prepared iodine ointment according to the U. S. P. VIII formula, and assayed it at intervals. His results are tabulated herewith:

	Per cent
Iodine introduced	4.00
Iodine found immediately after making	3.89
Iodine found one hour after making	3.51
Iodine found one day after making	3.48
Iodine found five days after making	3.06
Iodine found ten days after making	2.84
Iodine found thirty days after making	2.81
Iodine found ninety days after making	2.81
Iodine found eight months after making	2.81

Iodine ointment has been official in the U. S. Pharmacopeia since 1870. Briefly, the method now used for making the preparation is as follows:

Four Gm. of iodine, 4 Gm. of potassium iodide and 12 Gm. of glycerin are weighed into a tared mortar and the mixture triturated until the iodine and potassium iodide are dissolved and a dark, reddish-brown, syrupy liquid is produced. Eighty Gm. of benzoinated lard are then added in small portions and with trituration after each addition. The mass is then triturated until of uniform consistence.*

* The time required to complete the process after the initial portion of lard had been added should be about twenty minutes.

Iodine ointment is officialized also in several foreign pharmacopeias, although the iodine strength of the several preparations is not uniform. The formula in the British Pharmacopeia is exactly like that in the U. S. Pharmacopeia except that pure lard is directed to be used instead of benzoinated lard. Some of the foreign pharmacopeias also specify that the preparation must be freshly prepared when wanted. In the earlier editions the U. S. Pharmacopeia directed the ointment to be prepared by using water as the solvent for the potassium iodide. In the U. S. Pharmacopeia VIII the formula was changed so as to employ glycerin, and that solvent is now official. Water is still prescribed as the potassium iodide solvent by the Pharmacopeias of the Netherlands and of France.

From the examination of the literature it seems probable that iodine ointments which contain petrolatum products only as the ointment bases are apt to be relatively stable, so far as the content of free iodine is concerned. On the other hand, ointments the bases of

⁹ *Pharm. Jour.*, 89, 610 (1912).

which contain fats of the unsaturated fatty acid series, such as oleic acid, do not satisfactorily preserve the iodine in the free state. In the latter class it seems likely that the iodine enters into combination with the unsaturated fatty acids. Accordingly, on theoretical grounds, an ointment base composed of pure stearin (if such substance were available) but softened by an admixture of liquid petrolatum would preserve the iodine satisfactorily. Coconut oil (iodine No. 8) ought to be suitable also if mixed with hard paraffin.

Since the literature was not sufficiently concordant to warrant positive conclusions concerning the stability of ointments containing free iodine, it seemed worth while to conduct experiments with preparations of known origin. Accordingly a number of preparations containing free iodine were made under varying conditions and each was assayed for its free iodine content immediately after its manufacture and from time to time later.

Leaf lard of the best quality obtainable was purchased from a butcher. This was rendered in an open dish on the steam bath. The preparation was of a fine color, and uniform consistence and had a faint but not unpleasant odor. Two specimens of lard were furnished by the research department of Armour and Company. An effort was made to procure specimens of lard having iodine absorption numbers as far apart as possible, *i. e.*, one with a low and the other with a high iodine value. This was done in order to determine whether the keeping qualities of the ointments prepared from the two would be alike.

One of the specimens (*a*) was described as

"Natural lard; iodine value, 57.1. Leaf lard used exclusively for but-terine and benzoinated lard."

The other specimen was described as

"Prime steam lard. Good, commercial grade of lard for general use; iodine value, 69.0."

The iodine absorption numbers of the three specimens were determined by the U. S. P. process, and were found to be as follows:

Laboratory rendered specimen	57.1
Armour specimen (<i>a</i>)	57.65
Armour specimen (<i>b</i>)	67.55

Each specimen was benzoinated according to the process described in the U. S. P. IX and 100 Gm. of iodine ointment were pre-

pared from each according to the U. S. P. process. Another specimen was made from benzoinated lard and iodine only* without the addition of either glycerin or potassium iodide. This was made to contain 4 per cent. of iodine.

Immediately after preparation each of these iodine ointments was assayed for free iodine, and each was reassayed at intervals later. The method for the determination of iodine in the ointment was that employed in this laboratory for the determination of iodine in Iocamfen Ointment.¹⁰ It is essentially the same as was employed by Pullen for the determination of uncombined iodine in iodine ointment.¹¹ As carried out in this laboratory for iodine ointment it is as follows:

From 5 to 8 Gm. of the ointment were weighed in a small porcelain capsule, the capsule and contents placed in a 16 oz. salt mouth bottle together with 20 Cc. of chloroform, 10 Cc. of potassium iodide solution and 40 Cc. of water. Tenth-normal sodium thiosulphate was slowly added with agitation until the pink color of the chloroform layer had nearly disappeared. A little soluble starch was then added and the titration continued until a blue color in the aqueous layer could no longer be obtained by repeated shaking.

The findings for the several assays are tabulated herewith:

TABLE I.
Iodine Content of Iodine Ointments.

Age at time of assay.	U. S. P. ointment from laboratory rendered lard (% I).	U. S. P. ointment from commercial lard Grade I (% I).	U. S. P. ointment from commercial lard Grade II (% I).	Ointment from lard and iodine only (laboratory rendered lard) (% I).
Freshly made.....	3.32	3.26	3.30	0.32
After 3 days.....	3.25	—	—	0.23
After 7 days.....	2.99	3.17	3.15	—
After 3 weeks.....	3.01	3.19	3.07	—
After 7 weeks.....	3.12*	3.10	3.02	—
After 3 months.....	2.98	2.88	2.88 *	—

* This slight rise in iodine content followed by a fall could not be accounted for. The specimen was believed to have been very thoroughly mixed at the time of manufacture.

That the fatty constituents of the ointment contained iodine after the preparation had been made for some time was demonstrated. Some of the material was examined as follows:

* In order to facilitate the incorporation of the iodine with the fatty base the iodine was first powdered by trituration with alcohol and drying the powder in the air.

¹⁰ *Rep. Lab. A. M. A.*, 9, 118 (1916).

¹¹ *Pharm. Jour.*, 89, 610 (1912).

A portion of the ointment which had been made for nearly three months was shaken in a separator with chloroform and a dilute mixture of potassium iodide and sodium thiosulphate solutions. After all of the free iodine had been removed the chloroformic solution of the fats was washed several times with a very dilute solution of sodium thiosulphate. The chloroformic solution was filtered, evaporated and the residue dried over sulphuric acid.* The separated fat was then tested for iodine by Kendall's method.¹² It was found to contain iodine in considerable amounts, but quantitative determinations were not made.

The Pharmacopeia of the Netherlands directs that iodine ointment shall contain 3 per cent. of potassium iodide and 2 per cent. of iodine instead of equal proportions (4 per cent. of each) as prescribed by the U. S. Pharmacopeia. Likewise the French Pharmacopeia directs that 10 per cent. of potassium iodide and only 2 per cent. of iodine shall be used. Both of these pharmacopeias use water instead of glycerin as the solvent. Loose combinations of iodine and potassium iodide, such as is represented by the compound having the formula KI_3 , have been described. The quantity of potassium iodide prescribed by the U. S. Pharmacopeia for the preparation of iodine ointment is not sufficient to form such a compound as KI_3 with all of the iodine directed to be used. Since some of the pharmacopeias use larger proportions of potassium iodide (more than sufficient to form the compound, KI_3), it seemed worth while to determine whether an ointment containing a greater proportion of potassium iodide than that required by the U. S. Pharmacopeia would be more stable than the official article. Accordingly a specimen was prepared to contain 4 per cent. of iodine, 8 per cent.

*The resultant fatty residue was of a brownish-green color. It no longer had either the taste, color or odor of lard. It was noted that the fats, after removal by this method from the freshly prepared ointment, were nearly white. As the ointment aged the fat became successively darker in color.

¹² The method depends upon the conversion of all of the iodine compounds into iodate by fusion with sodium hydroxide and oxidation with potassium nitrate. The melt is dissolved in water, a little sodium bisulphite added, the solution cooled and neutralized with phosphoric acid, using methyl orange as indicator. An excess of bromine water is added, and the mixture boiled to expel carbon dioxide and bromine. A little sodium salicylate is added, the solution cooled, an excess of potassium iodide added, and the liberated iodine titrated with tenth-normal sodium thiosulphate in the usual way. One sixth of the iodine found is obtained from the material assayed, the balance being furnished by the potassium iodide added. *Jour. Biochem.*, 19, 251 (1914).

of potassium iodide (twice the U. S. P. requirement), 12 per cent. of glycerin and 76 per cent. of lard. This was assayed for its free iodine content immediately after preparation, and found to contain 3.68 per cent. Nine days later it contained 3.70 per cent. Another specimen of the same iodine strength prepared from grade No. 2 of commercial lard assayed 3.69 per cent. at the initial assay, and seven days later 3.40 per cent. From these experiments it seems likely that the free iodine content of the U. S. Pharmacopeia iodine ointment could be raised somewhat by increasing the proportion of potassium iodide.

The results of these studies confirm the findings of Pullen and of Fried in all essential particulars. It appears that during the process of manufacture of iodine ointment about 20 per cent. of the free iodine goes into combination with the fatty constituents of the ointment. On standing for a month approximately an additional 5 per cent. goes into combination, after which there is practically no loss in free iodine content. In other words iodine ointment which is a month old is a relatively stable preparation. It appears to make no noticeable difference upon the rate and amount of iodine absorption whether the lard from which the ointment is made has a high or a low iodine absorption value. The composition of iodine ointment, which has been made sufficiently long to have reached equilibrium, is approximately as follows:

Free iodine	3 per cent.
Iodine combined with fat	1 per cent.
Potassium iodide	4 per cent.
Benzoinated lard (containing iodine)	80 per cent.

The U. S. Pharmacopeia requirement that iodine ointment shall be freshly prepared when wanted appears to be unnecessary. Probably most pharmaceutical manufacturers are aware of this, for many of them include the preparation in their trade lists. The presence of an iodide appears to be necessary, to prevent practically all of the iodine from entering into combination with the fat.*

* In order to determine whether the iodine which is in combination with fat is absorbed through the skin, a few experiments were carried out. The dark-colored iodine-containing fat (obtained from the ointment and washed free from potassium iodide by the method described above) was rubbed thoroughly into the skin of the forearm. It was allowed to remain for four hours, after which the limb was scoured with soap suds. Beginning at the time of the application the urine was collected for forty-eight hours. This

DETERMINATION OF ASPIRIN AND SODIUM SALICYLATE IN POWDERS.

BY REGINALD MILLER, Chemical Laboratory, New York City Dept. of Health.

Among samples received at the Laboratory were those consisting of aspirin and sodium salicylate. The following method has been found satisfactory, and its publication may assist others who are doing similar work.

Aspirin.—Weigh the collective contents of several packages, mix thoroughly. (If sample is not a fine powder, grind it in a mortar until it is.) Take a weighed portion corresponding to that of one package, transfer to a small beaker, add an equal volume of clean sand, and 8 or 10 mls of ethyl ether, stir the mass with a glass rod, allow to settle, decant through a small dry filter paper, repeat the extraction about ten times, collect the filtrates in a weighed glass dish, evaporate to dryness. Weigh.¹

Residue should respond to the following tests:

Conc. nitric acid—yellow, gradually deeper.

Froede's reagent—immediate purple coloration.

Formaldehyde sulphuric acid—faint red color after one or two minutes.

Selenious sulphuric acid—No change in color.

Conc. sodium hydroxide—No change in color.

Sodium Salicylate.—To the beaker containing the sand and the portion insoluble in ether, transfer the filter paper (that was used

was evaporated to small bulk and the residue tested for iodine by Kendall's method. Small amounts of iodine were found. These findings were taken to indicate that the iodine-containing fat is absorbed to some extent by the skin. It is generally believed that potassium iodide is not absorbed by the unbroken skin. Therefore it seems reasonable to suppose that the principal iodine effects obtainable from iodine ointment are those due to the free iodine contained in the preparation, supplemented to a slight extent by the iodine which is contained in the fatty ointment base. *Jour. Biochem.*, 19, 251 (1914).

¹ The aspirin may be checked by taking a weighed portion of the original sample (about .100 G.), dissolve it in 95 per cent. alcohol (neutral) and titrate it with $\frac{N}{10}$ sodium hydroxide, using phenolphthalein as the indicator. One mil of $\frac{N}{10}$ sodium hydroxide = .0180 G. of aspirin. If substances are present which interfere with the determination directly on the powder, take a weighed portion of the residue (about .050 G.) and titrate with the $\frac{N}{10}$ alkali.

in aspirin determination) add dilute sulphuric acid (about 10 per cent.) until the mass is moistened throughout,² repeatedly extract with ethyl ether, making about twelve extractions, filter through a dry filter paper and collect filtrates in a weighed glass dish. Evaporate to dryness, weigh the residue, which is salicylic acid.³

Ferric chloride added to an aqueous solution, gives a bluish violet coloration.

A small portion of salicylic acid heated with several drops of methyl alcohol and sulphuric acid (conc.) will give the characteristic wintergreen odor.

Sodium salicylate is computed from the salicylic acid by multiplying by the factor 1.1651, which gives U. S. P. sodium salicylate of 99.5 per cent. purity, or by the factor 1.1593, which gives C. P. sodium salicylate.

REASONS FOR SOME OF THE CHANGES IN THE FORMULAS OF GALENICALS MADE IN THE NINTH REVISION OF THE UNITED STATES PHARMACOPEIA.¹

BY GEORGE M. BERINGER, PH.M.

At the meeting of the Philadelphia Branch of the American Pharmaceutical Association held in November, 1916, the writer presented a paper under the above title. As the program for that meeting was a symposium on the Pharmacopeia and there was assigned to me the title "Extracts, Fluidextracts and Tinctures," my communication was primarily restricted to the changes made in these classes of official galenicals. The favorable comments elicited by the publication of that paper appear to indicate that a continuation of the subject to the other galenicals of the pharmacopeia would be an appropriate topic for presentation at this meeting.

The reasons for some of the changes made in the revision of the pharmacopeia are so easily understood as to be classified as "self-

² The sulphuric acid must be in excess, in order to completely decompose the sodium salicylate.

³ The salicylic acid may be checked by titration, using $\frac{N}{10}$ barium hydroxide and phenolphthalein as the indicator. One mil of $\frac{N}{10}$ barium hydroxide = .013805 G. pure salicylic acid.

¹ Read at the meeting of the New Jersey Pharmaceutical Association, Hotel Breslin, Lake Hopatcong, June 14, 1917.

apparent," but for other changes it may be difficult to assign a tangible explanation.

The decision whether an article or formula shall be admitted to, retained in, or deleted from the official list of titles is presumed to be based upon the medical practice of the time and the general or extended use of such medicament. The late Professor C. S. N. Hallberg assiduously gathered statistics from all over the United States to determine the facts regarding the use of hundreds of drugs and preparations with the expectation that the statistics so gathered would be available and accepted by the Committee of Revision as the basis for deciding the admission, retention or dismissal of articles on the official list. The decisions of the committee seem to indicate that these data were not given the consideration it had been expected they would receive and that the decisions on such matters were largely based on personal practice and preferences. Consequently, it is hard to reconcile as consistent the changes made by the additions and deletions. It is, for example, difficult to explain why acidum camphoricum was dismissed and acidum phenylcinchonicum has been admitted, and why apocynum and fluidextract of apocynum were deleted and aspidospermum and fluidextract of aspidospermum have been introduced.

On the basis of American medical practice and use, it is even more difficult to explain the expulsion from the official list of such popular formulas as cataplasm of kaolin, antiseptic solution, Goulard's cerate, compound resin cerate, compound acetanilid powder, mixture of rhubarb and soda, compound spirit of ether, compound syrup of hypophosphites, and ointment of red mercuric oxide. How fortunate it is that we have in the National Formulary a second legal authority and that it has incorporated these formulas and so retained authoritative legal standards for these. It may be that the knowledge that the National Formulary would probably adopt these dismissed formulas may have influenced the decisions of the pharmacopeia revision committee. Whatever may have been the cause, these actions demonstrate the necessity for the two legal standards and how fortunate it was that the National Formulary was systematically revised. The increased importance thus accorded to the National Formulary now makes imperative that it be permanently maintained on a high scientific basis.

The improvements in the directions for the preparing and the proper storing of galenicals in order to insure permanency and

efficiency of the products is in evidence throughout the U. S. P. IX. As examples, chloroform water, creosote water, orange flower water and rose water are directed to be prepared with recently boiled distilled water.

In aqua hamamelidis, the impractical and inaccurate formula of the U. S. P. VIII has been omitted. The production of this preparation can not be undertaken by the pharmacist and it can only be carried on as a commercial operation in favorable localities. The Pharmacopeia has rightly eliminated the process and standardized the product so far as possible and supplied appropriate tests for adulterants.

The readiness with which the public accepts and the drug trade adapts itself to the legal pronouncements of the pharmacopeia has been shown by the universal acceptance of the official standard for poison tablets of corrosive sublimate. The prompt disappearance from the drug stores of the formerly extensively used white disk shape of sublimate tablets has minimized the danger of accidental poisoning from this source, which was for a time so prolific of fatalities.

The number of cerates has been reduced from six to three and the formulas of two of these retained are notably improved. The U. S. P. VIII directed 20 per cent. of white petrolatum to be used in the formula for cerate. Petrolatum in this mixture of wax and lard did not prove to be satisfactory or yield a uniform smooth product; hence, the return in the formula to white wax and benzoinated lard was decided upon.

In the U. S. P. VIII formula for cantharides cerate, the powdered cantharides was directed to be macerated "in a warm place for forty-eight hours with the liquid petrolatum." Liquid petrolatum is not a good solvent for cantharidin and no attempt was made by this formula to liberate the combined cantharidin or to obtain the maximum effect from the cantharides used. In the improved formula of the ninth revision glacial acetic acid is directed to liberate the cantharidin and likewise to aid in its solution in the turpentine. The formula is very satisfactory and with good cantharides will yield an efficient epispastic.

In cantharidal collodion, we note another improved formula based upon our knowledge of cantharides and the proper solvents for its constituents. In the U. S. P. VIII formula for this, the cantharides was directed to be exhausted with chloroform and the

extract so obtained mixed with flexible collodion. The resulting product usually gelatinized or precipitated in a short time and became worthless. The extraction with a mixture of acetone and acetic acid now directed yields an active and permanent preparation.

In flexible collodion of the revision, by the use of camphor and castor oil in appropriate proportions a closely adhering stronger and more flexible film is produced than that yielded by the old formula with larger quantities of Canada turpentine and castor oil and does so at considerable saving in cost.

Elixir glycyrrhiza is now the official title instead of elixir adjuvans, the slight increase in the amount of the fluidextract of glycyrrhiza directed only rounding out the proportion of 1 to 7 of elixir.

In modern pharmaceutical practice, emplastra do not play a very important rôle. The preparation of adhesive plaster and belladonna plasters now used can only be attempted on a large scale and with special machinery; hence, formulas for these are omitted.

Lead plaster, instead of being prepared by decomposing soap by lead acetate, as in the U. S. P. VIII is now directed to be made by boiling with water equal weights of lead oxide, olive oil and lard. If ingredients of proper quality be used, the resulting product will no doubt be satisfactory.

In infusion of digitalis, we note a change of doubtful propriety, namely, the omission of alcohol. The argument used in favor of this change was that the alcohol played no part in the extraction of the drug or the therapeutic activity of this preparation and that it gave a false impression as to the stability so that the infusion probably would not be made and used as fresh as it should be. While it must be acknowledged that the alcohol is not necessary for the making of the infusion, it is nevertheless uncertain if it did not serve a useful purpose in the formula. Infusion of digitalis is not administered while freshly made and warm and in large doses, as are many of the common infusions. The physician usually directs a dose of from one to four fluid drachms² several times a day and prescribes sufficient for several days. The 10 per cent. of alcohol formerly directed was sufficient to preserve the infusion for this limited period and I am not convinced that it did not like-

² It is to be noted that the average dose of the U. S. P. VIII was given as 2 fluid drachms and the U. S. P. IX now states: Average dose 1 fluid drachm.

wise exert some therapeutic action by stimulating the absorption of the digitalis. Complaint has already been made that the infusion made by the new formula, without the alcohol, very soon spoils. Our experience with the other digitalis galenicals proves that the glucosides of this drug are readily hydrolyzed even in a menstruum of diluted alcohol, and to avoid rapid deterioration in the tincture and fluidextract, the Pharmacopeia has increased the alcoholic content of these preparations. Yet on theoretical grounds, not substantiated by either practical experiment or therapeutic testing, the alcohol was stricken from the infusion, one of the most important of diuretic and cardiac remedies.

Ammonia liniment is directed to be made by agitating 1 volume of ammonia water with 3 volumes of sesame oil and this simple procedure yields a perfect preparation. The U. S. P. VIII patriotically endeavored to utilize in this formula an American product, cotton-seed oil, and in order to saponify this added oleic acid and alcohol, thus presenting a wasteful and ridiculous formula.

In mucilage of acacia, the Eight Revision directed the use of 33 per cent. of lime water in order to overcome the natural acidity of acacia. The lime water content at times created incompatibility as, for example, when the mucilage of acacia was directed to be used to suspend calomel. The revision rightly omits the lime water and directs that this mucilage should be frequently made and not dispensed if it has deteriorated.

In oleate of mercury, the use of alcohol in place of water will shorten the time required and diminish the danger of reduction of the mercury.

The change made in the formula for soft soap, cotton seed oil being directed in place of linseed oil, has likewise been directed by economic reasons rather than by scientific. The new formula is defective and the product is deficient in that very necessary property of a soap, namely, detergency.

In the mint spirits, the respective peppermint or spearmint, used for coloring and clarifying, is first washed with water which removes the brown and yellow colorings as well as much extraneous dirt and the resulting spirit is more uniformly of a bright green color.

The acid content of syrup of hydriodic acid was slightly increased so as to make the official syrup not below the strength claimed for some of the proprietary syrups.

In syrup of calcium lactophosphate and in syrup of hypophosphites, the addition of 50 mils of glycerin to the liter adds materially to the stability of these syrups.

In syrup of wild cherry, we note a return to the method of adding the glycerin to the first portion of the menstruum instead of to the percolate. While this procedure may yield a deeper colored syrup that may be richer in tannin, it is doubted if this should be the proper aim and it is questioned whether the hydrocyanic acid content is not actually diminished.

In the ointments, a few changes are noteworthy. Such minor changes as those made in belladonna ointment and in diluted mercurial ointment are readily understood and will cause little comment. In diachylon ointment, white petrolatum is substituted for olive oil, which yielded an ointment of too fluid a consistence. Ointment of phenol is reduced from 3 per cent. phenol to about 2 per cent. and ointment is directed as the base instead of white petrolatum. The changes made in the formula may cause some trouble with customers to whom it may be difficult to explain the difference in the appearance of carbolic ointment.

The elimination of all wines from the Pharmacopeia was probably due to a misunderstanding of the requirement of the Brussels International Protocol. Physicians will continue to prescribe the wines of antimony, colchicum, ipecac, etc., and pharmacists will furnish these as heretofore. In the formula for compound mixture of glycyrrhiza, the substitution of the equivalent amount of tartar emetic dissolved in water for the wine of antimony is directed and this was the only change in the official formulas necessitated by the deletion of the class of wines from the Pharmacopeia.

LEAD IN MEDICINAL ZINC OXIDE.¹

BY CHARLES H. LAWALL.

Zinc oxide has been a medicinal substance of importance for several hundred years. It was official in the first U. S. P. with a method of preparation from the metal, which would give a modern pharmacist something to exercise his professional skill upon, if he

¹ Read at the annual meeting of the New Jersey Pharmaceutical Association, June 14, 1917.

were now, as he was then, dependent entirely upon his own exertions for his supply of many of his chemicals.

For many years the supplies of zinc oxide entering the pharmaceutical trade were of high quality, and while it was necessary occasionally to reject a lot, there was not a great deal of trouble in obtaining supplies which were in full compliance with the U. S. P. in every respect.

This condition has recently changed, and I think I can safely assert that ninety per cent. of the zinc oxide on the market at the present time will not only not answer the U. S. P. test for absence of heavy metals but that in the majority of instances lead is present in an amount ranging from 0.1 per cent. to 0.5 per cent. calculated as metallic lead.

This condition has come about through the well-known fact that few if any pharmacists test their supplies and still fewer pay any attention to such statements of the label as "U. S. P. in all respects except the heavy metal test."

No statement has appeared in recent literature calling attention to this condition, nor do the standards of any of the prominent pharmacopeias of the world make any allowance for such large amounts of this impurity in zinc oxide. The latest editions of the following pharmacopeias were consulted: Austrian, Belgian, British, Danish, French, German, Italian, Japanese, Netherland, Norwegian, Swedish, Swiss, Spanish and our own U. S. P.

In all of these there is a specific test for the absence of lead, the test being made in a slightly acid solution of the oxide with solution of hydrogen sulphide, the requirement being that a white precipitate be produced. The German Pharmacopeia has in addition a specific test for absence of lead with potassium chromate solution in an acid solution of the oxide.

In applying the hydrogen sulphide test, found in all of the Pharmacopeias quoted above, some difficulty is often experienced in observing the darkening due to lead on account of the interference of the light colored zinc sulphide which comes down and obscures the test and frequently makes it necessary to add repeated amounts of hydrogen sulphide and then make the final observations in comparison with a sample to which a known amount of lead has been added.

A very satisfactory method of detecting and estimating the lead which seems to be present occasionally as the sulphate, in part at

least, is to dissolve 5 grammes of the sample of zinc oxide in a slight excess of diluted sulphuric acid, with gentle heat; collect and wash the precipitate with distilled water; then pour through the filter containing the precipitate a concentrated solution of ammonium acetate (about 25 per cent.) freshly made, and to this filtrate which now contains the lead in a soluble form add a slight excess of solution of potassium chromate which will precipitate insoluble lead chromate which may be collected on counterpoised filters, or on a Gooch crucible mat, washed, dried, weighed and calculated as to its percentage. A more expeditious method which gives very good results with the amount of lead usually found at the present time is to simply dissolve 5 or 10 grammes of the sample in an excess of acetic acid and then perform the precipitation with potassium chromate in this solution directly, and collect, wash and weigh the precipitate as before. This latter modification will give low results, however, where part of the lead is present in the form of sulphate, as is often the case, as the sulphate will remain behind when the solution is made in acetic acid.

It would seem to be advisable for pharmacists to make an inspection of their stocks of zinc oxide and to firmly reject all samples containing lead in excess of the U. S. P. requirements. If this be generally done the manufacturers of zinc oxide will have to find some way of supplying the pharmaceutical trade with the lead-free zinc oxide to which they have been accustomed and to which they are entitled. Just as long as pharmacists continue to take whatever is offered to them, no matter how plainly it may be labeled as to deviation from the official requirements, just as long will this sort of thing continue. Zinc oxide containing from 0.1 to 0.5 per cent. of lead is certainly not a proper article to use in making the ointment, and concerted action on the part of pharmacists all over the country would bring about a speedy improvement of this condition.

CONTAMINATION OF WILD CHERRY BARK WITH METALLIC IRON.¹

BY CHARLES H. LA WALL.

A rather unusual contamination of wild cherry bark with particles of metallic iron was recently observed, which may be worth recording because of the unsuitability of such bark for making the official preparations of wild cherry and because of the possibility that other lots of the same kind of ground bark may be on the market and that other pharmacists may have experienced the trouble described below and were unable to account for it.

A lot of wild cherry bark, ground to the official degree of fineness, was purchased by Prof. E. F. Cook, director of the operative pharmacy laboratory of the Philadelphia College of Pharmacy, for use by the class in making syrup of wild cherry. There was nothing suspicious or unusual-looking about the drug and it was used by nearly 100 students in making syrup of wild cherry by the U. S. P. IX method, which involves a preliminary maceration of the ground drug with the glycerin-water menstruum for twenty-four hours. The next day the drug in every one of the percolators was black and the percolate which came through upon beginning the operation looked more like ink than an infusion of wild cherry.

An investigation of the drug showed an ash slightly high but not abnormally so, and in this connection it may be appropriate to note the fact that for some reason the U. S. P. requirement for ash, which is part of the text of other vegetable drugs, is lacking in the case of wild cherry. The ash showed indications of an abnormally high proportion of iron, which was confirmed by comparative colorimetric tests upon the sample in question with another sample which showed no discoloration in making the infusion, dissolving the ash of each in diluted hydrochloric acid, oxidizing with a drop or two of nitric acid and adding potassium sulphocyanate T. S. The normal sample of wild cherry gave but a faint pink color while the abnormal sample yielded a deep red solution.

A 10-gramme portion of the wild cherry was mixed with 100 Cc. of distilled water in a large-sized beaker and the contents, after

¹ Read at the meeting of the Pennsylvania Pharmaceutical Association, 1917.

thoroughly mixing, were given a rotary motion and allowed to settle. Upon observing the sediment which collected in the center of the bottom of the beaker, a number of small black particles were noted, which, when withdrawn and subjected to appropriate tests, were identified as particles of metallic iron, clean and free from oxidation.

Two separate 10-gramme portions of the powder were then taken and a small horseshoe magnet, which had previously been weighed, was used to remove the particles of iron quantitatively. One portion showed 0.025 Gm. and the other portion 0.028 Gm. of magnetic particles of unoxidized iron. The presence of this iron can probably be accounted for by the use of a mill with iron grinding surfaces.

THE NEED OF EMPHASIZING THE VALUE OF PHARMACY.¹

BY EUGENE G. EBERLE.

That repetition is a power in shaping the affairs of men was recognized from earliest periods and has continued a means for influencing the thoughts and therefore the activities of men and nations. What is said to a person once is readily forgotten, but continued impressions of the same view makes it a part of the individual's reasoning and action. I am not saying this as an apology for attempting to convey to you in this effort a message which is old and has been repeated many times in one way or another, and one that I have spoken and indited on many occasions and repeated several times in recent months, namely, that pharmacy is a profession, and that professional recognition of druggists can only be rightly expected when they practice pharmacy.

A great deal has been said anent this subject recently, and more specifically in connection with the establishment of a pharmaceutical corps in the United States Army. Some things have been mentioned in opposition to the movement and considerable silence obtains on both sides of the question. If pharmacists want professional recognition a sufficient interest must be persistently and insistently exhibited by them, showing that they really desire it. Neither silence, apathy nor indifference are positive arguments.

¹ Read before the Pennsylvania State Pharmaceutical Association, June 19-21, 1917.

That there is a tendency to ignore pharmacy is evidenced by the Government in not having provided even in our present crisis, when the coöperation of every industry and profession is necessary, a place in the army organization for the professional services of pharmacists, on a basis that will prove their value and require of pharmacists to show their ability to be of service.

The government is not alone in this lack of consideration or confidence, it obtains with related organizations in promotions wherein pharmacy should have a part. A letter of Dr. Edward Kremers to the American Pharmaceutical Association under date of March 27, 1917, points out such attitude or disregard by constituted bodies or associations; pharmacy was ignored in the Committee of One Hundred, organized for the purpose of starting a movement looking toward the establishment of a Department of Health and Sanitation with a cabinet officer at the head. Again, in the Committee of the National Research Council, appointed by the National Academy of Sciences, pharmacy was not included, though even astronomy was thus honored. A movement has been started for organizing an institute for the history of science and civilization, where again one looks in vain for the name of a pharmacist. The concluding statements by Doctor Kremers are quoted in full:

"All that I wish to point out is that the emphasis of commercial pharmacy, while it may place a dollar in our pockets to-day, is ruining our future as a calling. Not only are we ignored in the national movements referred to, but we are losing locally. Fifteen years ago, the food and dairy commissions took over part of the duties of our state boards of pharmacy and thereby deprived our calling of so much home rule. To-day the state boards of health are ready to take over what little self-government remains.

"Our state boards were told twenty years ago that unless they made a serious business of drug-store inspection, this aspect of self-government would be turned over to our food and dairy commissions. For some years past they have been warned that the tendency to concentrate state commissions and related offices would affect them and that they should get ready to take a leading part in this constructive movement. They have heeded neither warning and are now facing control by the medical profession as well as food and dairy commissions."

A profession is a vocation in which a professed knowledge of some department of science or learning is used by its practical application to affairs of others, in serving their interests or welfare in the practice founded on it. Accepting of this definition, pharmacy can certainly enroll. For this association, it is unnecessary to give

examples of pharmacists who can eminently qualify or of those who in the past have measured up to this definition. But may we not say to ourselves, and repeat frequently, that we should have a higher professional appreciation of pharmacy, of all who serve devotedly and a greater reverence for those whose work has given us a profession.

A few weeks ago a visitor from this section of the country was one of the speakers at a banquet in San Antonio, Texas; it was probably expected of him that he should dwell upon another topic, for in his introductory remarks, he said:

"I am going to take a woman's privilege and change my mind. The thing which brought me to Texas is dear to my heart, but there is another thing which is far, far dearer to it. I am coming to you, loyal citizens of Texas, with an appeal upon my lips. I am going to beg your indulgence and your interest in behalf of a friend who needs more friendships. This one has many sons and daughters; he has reared them to competence and great estate, but they have not always remembered this. My friend is the United States, my country, your country, our country. And to-night for a little time I am going to ask you to forget San Antonio, Bexar County, and Texas and give your loving thought to the United States which stands for and behind each of them."

The speaker then referred briefly to community pride, expressed in a more distinctly commercial form which leads to campaigns of preferential movements. If these are held within rational bounds the promotion is commendable and valuable, but when it fundamentally lacks economic soundness, it defeats the purpose,—also when the interest of the community is the sole thought of the citizenship then the national spirit suffers, and this is essential in our present crisis.

It seems to me that these thoughts can be made more or less applicable to pharmacy and also to association interest. You will replace the words of the speaker "the friend who needs more friendships" by pharmacy and the American Pharmaceutical Association, and I will in a limited way endeavor to make use of them. If the remarks are not applicable to you, they may have application elsewhere and are not altogether unworthy of attention.

Practically, ever since there have been places for dispensing medicines and selling drugs other articles have formed part of the stock of the apothecary, for reasons that require no explanation. We are accustomed to speak of two divisions in the drug business, the commercial and the professional. The stocks of drug stores

are characterized by environments and the inclinations of the owners, how these are constituted, what proportion of the business is commercial or professional varies accordingly, and your information on the subject is likely more authentic than mine. This much may be said, however; that the necessity for a living profit or desire for doing a large volume of business has developed the commercial side of the drug business relatively more than the professional. This is a natural sequence, predominating attention to one side must of necessity weaken the other, and economic conditions have had a large part in shaping the drug business. In the constant attention to the development of the business there is apt to be a neglect of pharmacy, but it has or deserves to have a more important place in the drug business than the immediate revenue which may be derived from it warrants, but there is another side to the proposition. The public buys merchandise in drug stores because of their convenient locations and services; there is, however, the dominance of well-founded opinion, that accuracy and dependability obtain in connection with pharmacy. This contributory value or asset deserves our thoughtful consideration, we need more of the spirit of pharmacy. However much our efforts may be directed toward an increasing trade, whenever special or selective privileges are desired, we at once turn our attention to the argument that we are pharmacists, that special training has qualified us for certain work that should only be delegated to pharmacists. Pharmacy is the *alma mater* of the drug business, and is entitled to our constant consideration, not only in time of trouble when there is urgency for a qualified witness in our behalf. Pharmacy may need the side-lines of the drug business for its continuance, but surely the successful conduct of these departments is dependent on pharmacy. Repeating, the importance of the professional side of the drug business cannot be measured by the direct income supplied thereby but more so in that pharmacy characterizes the business.

Another thought: in the constant application to business affairs we forget those who are more intensely devoted to the research work of pharmacy and lend only little encouragement to our pharmacy schools. The value of pharmacy to the world rests not only on our own efforts, but on the labors of those who make and have made present-day progress attainable. We should not be unmindful of those of our profession whose achievements have influenced pharmacy and the related industries and of those whose discoveries

afford relief to the wounded, save and conserve the lives in countless homes and on the fields of battle. Our profession must live in the reverence we have for our precedents, in the work they made possible for us to do, because of it, and *our own* endeavors. A profession without ideals is dead, is useless.

We may point with pride to past records of pharmacy, but we ourselves must sustain its reputation, continue to improve it and make it increasingly valuable to the world. The votaries are the makers of the business they are engaged in, and in turn the character of it tells who and what they are.

Repeating my own words of a former address, associated service profits the individual who lends a helping hand in the promotion of the common interests of pharmacy more than if he had directed his activities without concerning himself with the interests of others, and this is relatively true as between associations. It should be the spirit of those engaged in the drug business whether they are most concerned in commercial lines or in professional pharmacy and should be the inspiration upon which we shall be lifted step by step to greater, broader and more hopeful things while laboring for our own interests, those of pharmacy and the welfare of human kind. Applying the same thought to coöperation among associations, such endeavor, if properly directed, should produce enhanced relative value, comparable to work of members within an association—the “work together proposition” is an essential factor for greatest success. We are generally agreed that the common interest of an association should be the interest of the individual member; so the interest of different associations having the same or closely related objects in common can be directed by harmonious coöperation for profit of each association and every individual is thereby benefited. It is this thought I want to impress, that the individual effort is enhanced by association work, so also “the work together” of associations has an increased relative value. The various drug associations should provide a plan linking them to the *alma mater* of associations, the American Pharmaceutical Association, and thereby greater work can be accomplished for pharmacy, the drug business in general and in the interests of those whom we serve. Such organization will afford greater opportunity for coöperation of the allied interests, to shape and regulate the drug business in general

on a rational basis and at the same time conduct or direct research work for all concerned.

In applying the points made at the beginning, pharmacy is the *alma mater*, from which have sprung the children—the various departments of the drug business. Too much consideration of these, too much enthusiasm because of their prosperity is apt to bring neglect of pharmacy. The realization of the dereliction comes when an effort is made to secure recognition on account of what should be the most important part of the drug business and is, too often perhaps, a very small part of it. The American Pharmaceutical Association and pharmacy have no easy task, they need and are entitled to the support of every one in the drug industries, because of their importance in sustaining them. I am loathe to decry commercial enterprise when it is kept within seemly bounds, but it must not be forgotten that however important and essential, the commercial departments of the drug store are still superstructures in the drug business resting upon and dependent for life on pharmacy.

Continued success demands efficient direction, and this is not possible in the drug business when pharmacy is not heartily supported. No department of the store should be planned without giving consideration to the pharmacy of it. This is real team work that requires watchful coaching; using a base-ball aphorism, "team score has right of way over the individual record." Make it apply both to pharmacy and the American Pharmaceutical Association. The present seems to be a most opportune time for securing a better recognition of the services of pharmacy and pharmacists; let us use our pharmaceutical energy and professional enthusiasm in that direction.

"If ever you feel that you gladly would shirk
The task that is set for the day,
Some fellow will offer to take on your work
While you go your own chosen way."

SOME PHARMACOPEIAL ENGLISH.¹

BY GEORGE M. BERINGER, JR., P.D.

The writer's attention was recently directed to the following advertisement which appeared in a leading New York daily:

"Girls wanted to sew buttons on the second floor."

Still more recently, he has been amused to find English of the same character scattered throughout the Pharmacopeia.

In the preface, the statement is made that

"The Convention recommended the insertion of *microscopical descriptions* of powdered drugs."

What a joy such descriptions would have been to students looking for "short cuts." What is meant, however, is that the Convention recommended the insertion of descriptions of the *microscopical characteristics* or *elements* of powdered drugs.

We are told that trichloracetic acid contains not less than 99 per cent. of $C_2HO_2Cl_3$ "when dried in a desiccator over sulphuric acid." To the novice it would appear that the desiccator and not the drug must be placed over the acid. It would have been better to have said: when dried to constant weight, *over sulphuric acid*, in a desiccator.

Adeps lanæ is directed to be the "purified fat of the wool of the sheep (*Ovis aries* Linné, Fam. Bovidæ) freed from water." Are the sheep to be freed from water or is it the fat that is to be so freed? If the sentence read: the purified and *water-freed* fat of the wool of the sheep, there could be no doubt.

Likewise, adeps lanæ hydrosus is stated to be "the purified fat of the wool of the sheep (.....), combined with not less than 25 per cent. nor more than 30 per cent. of water." The sheep would hardly combine with such an amount of water, therefore, it would be better to say: a combination or mixture of not less than 25 per cent. nor more than 30 per cent. of water with the purified fat of the wool of the sheep.

In giving directions for the testing of ether for peroxides, the operator is instructed to "shake the ether,, in a

¹ Read at the meeting of the New Jersey Pharmaceutical Association, Hotel Breslin, Lake Hopatcong, June 14, 1917.

glass stoppered cylinder previously rinsed *with the ether under examination.*" Does this mean that the operation of rinsing the cylinder must be under examination? If so, by whom? To the initiated, of course, it is plain that, with the ether, *which is being tested*, is meant.

There is one direction in connection with the preparation of liquor calcis which is destined to become famous: "Pour the liquid, holding the undissolved calcium hydroxide, in suspension, *into a tightly-stoppered bottle.*" Unfortunately, we are not told how this difficult feat can be accomplished. It should read: into a bottle *capable* of being tightly stoppered.

The faulty construction is particularly noticeable in the definitions of many of the newer drugs of animal origin. Thus, hypophysis sicca is "the posterior lobe obtained from the pituitary body of cattle, cleaned, dried and powdered." Why is it necessary to clean, dry and powder the cattle in order to obtain this small portion? Why not say, The *cleaned, dried and powdered, posterior lobe* of the pituitary body of cattle?

Suprarenalum siccum are "the suprarenal glands of animals used for food by man, cleaned, dried, free from fat, and powdered." Must man suffer such torture in order to be medicated with suprarenal glands?

It is also noteworthy that all the animals used for food by man are included. Fowl and fish are animals, but a well-posted veterinarian informed the writer that there is no mention in the literature of their having suprarenal glands. If they have such glands, the glands are not used medicinally.

The definition of thyroideum siccum is constructed on similar lines: "the thyroid gland of animals, which are used for food by man, freed from connective tissue and fat, dried and powdered." One might imagine the horror in the soul of a foreigner, with only an academic knowledge of English, should he interpret this statement literally. What amazement would be his at such strange American customs!

The directions for preparing albumen test solution read:

"Carefully separate the white of a *strictly fresh hen's egg* from the yolk."

In the directions for the determination of the ash of vegetable drugs, the following is given:

"Finally determine the weight of the ash, deducting the weight of the ash from the filter."

What is meant is: deducting the known weight of the filter ash from the weight of the total ash.

In the directions for the biological assay of cannabis, the statement is made that

"It is best to make preliminary tests upon several dogs with average-sized doses."

What part of the dogs are the doses? Why not say "*using average-sized doses*"? The statement is also made that

"Before administration the animal should not be fed for twenty-four hours in order to hasten absorption."

To whom is the animal to be administered? Why not say "before administration *of the drug*, and, better yet, change the position of the phrase.

There must be a hoodoo about cannabis for, in the preface, the following appears:

"The biological assay for pituitary solution and cannabis and its preparations is a requirement."

Does the same assay answer for both drugs? The form should be: The biological assay *of* pituitary solution and *of* cannabis is required.

In the paragraph on "Nomenclature" after mentioning the insertion of abbreviations of official titles, the following is given:

"It *was* believed that these *will* be of service, etc."

Here we have an entirely unnecessary and incorrect change of the tense of the verb.

The Pharmacopeia of the United States of America, in so far as the science and art involved are concerned, is as nearly perfect as human knowledge and ingenuity can make it. In fact, it has been called by certain foreign pharmacists the "autocrat among Pharmacopeias." It is, therefore, all the more to be regretted that the English of the work is not more perfect.

The writer has not attempted to note all the errors of this character in the book. In connection with such as he has noted, however, he has attempted to give constructive criticism, in the hope that more attention may be given to the English of the next revision.

TWENTY-FIFTH ANNIVERSARY OF THE H. K.
MULFORD COMPANY.

In 1887, H. K. Mulford, recently graduated from the Philadelphia College of Pharmacy, purchased the drug store at 18th and Market Sts., Philadelphia, from the then owners, Remington and Sayre. He conducted the business under the firm name of H. K. Mulford and Company.

Two years later Milton Campbell bought a half interest in the business and in 1890 E. V. Pechin associated himself with them. Like Mr. Mulford, the new partners were graduates of the Philadelphia College of Pharmacy. At this time the firm's largest assets were an invincible determination to do business as well as it was possible to do it, and in an outlook far wider than might be expected from their age and experience.

It may be interesting to note that the little corner drug store at 1800 Market St. had an interesting history. Professor Joseph P. Remington, Dean of the Philadelphia College of Pharmacy, may well be deemed the Nestor of his profession. Dr. Lucius E. Sayre is the present Dean of the Faculty and Professor of Pharmacy in the University of Kansas. Their predecessor, W. J. Simes, was the first rectifier of camphor in America, the store passed to him from Henry Bower, a pioneer manufacturer of glycerin, and he in turn took title from Samuel Eastlack, the first manufacturer of medicated lozenges.

This business history dating back to 1826 was necessarily a stimulant to the young firm and results show that early in their career they resolved to live up to their ancestry, and that they held steadfast to their resolution is evidenced by the fact that today, after a lapse of twenty-five years, the young men who presided over the retail drug store are the arbiters of the destinies of a two million dollar corporation, a corporation favorably known in every quarter of the globe.

Mr. Milton Campbell is the president, Mr. H. K. Mulford the vice-president, and Mr. E. V. Pechin the secretary of the H. K. Mulford company.

This, in itself, is quite uncommon, and when we add the statement that the original members of the firm have through good and bad times, through all troubles and reverses, through all periods of

prosperity kept their heads and grown nearer each to the other in trust and friendship, it becomes apparent that the celebration of the twenty-fifth anniversary of their business career is a red-letter day indeed.

It is proper at this time to review the work of the company during its adolescence in order to determine to what extent the ambitions of the past have become the attainments of the present.

The success has been undoubted, almost unprecedented in the history of manufacturing pharmacy. The acorn of 1891 is the sturdy oak of 1916, and it becomes us to seek the cause of this continued and rapid growth. We believe the answer may be found in a single word—*service*.

The firm has from the first day conducted its business with a determination of doing it as well as possible, believing that more than a business—a trust—had been committed to the care and guidance of its members. For some years the H. K. Mulford Company was engaged in the manufacture of pharmaceutical preparations only, and the improvements instituted in the production of compressed and friable tablets, effervescent salts, elixirs (at one time a leading specialty), fluid and solid extracts, tinctures and ointments gave prominence to these productions of the firm at an early period of its history, and the Keystone label became recognized as the standard of quality. At the time of which we are now writing it was the custom to throw a veil of secrecy around the formula and preparation of pharmaceutical specialties and to claim virtues for them that existed only in the imagination of their proprietors.

The H. K. Mulford Company, recognizing that pharmacy was but a department of the science and art of medicine; realizing its responsibilities to the medical profession and the public; believing itself bound by the Hippocratic Oath, and, regarding medical ethics as a unity, one and indivisible, placed the formula of every preparation on its container and confined its statements to quotations from physicians, who prescribed them. *Here as always decency had its reward.*

While the work of the Mulford laboratories in pharmacy and pharmacology alone would entitle the firm to the very highest standing, it did not remain content with those spheres of activity, and in the year 1894 instituted the first commercial laboratory in the United States for the preparation of biological remedies.

The first product of the new laboratories was diphtheria anti-

toxin. The physician specifies "Mulford" if he desires the most potent and sterile product. If he would use an American product in 1894 he specified Mulford for the reason that it was the only source of supply, today he demands the Mulford brand because he knows that it is an absolutely safe source of supply.

It is not an idle play with words to say that "diphtheria antitoxin" suggests "Mulford" and "Mulford" "diphtheria antitoxin." We believe that this first born product of the Mulford biological laboratories is today the most concentrated, safe and sterile product of its kind.

The H. K. Mulford Company was the pioneer in the work of physiological testing and chemical standardization of pharmaceutical products, and the present status of these methods of determining drug values may be said with due modesty to be largely owing to the work of the Mulford laboratories. Here the firm has always led, and at the present time it physiologically tests and standardizes every drug lending itself to those methods. Much of the results of this work have been given to the medical profession through the medium of "working bulletins" and the demand for these for use of medical schools is quite large, and, it is needless to say, cheerfully supplied, as a contribution to medical progress.

This Mulford Working Bulletin System receives universal recognition, is kept thoroughly up-to-date and, we may further state in this connection, that one of the most common, and we are glad to add, most pleasant duties of our scientific staff is to afford information of the character outlined above, to the medical, veterinary and pharmaceutical professions.

Not only was the H. K. Mulford Company the pioneer producer of diphtheria antitoxin on a commercial scale, but it has been and still is a consistent and continued worker on the problem of its improvement, and the product of today concentrated, sterilized, highly potent, furnished in sterile containers, leaves little to be desired.

The production of diphtheria antitoxin was quickly followed by tetanus antitoxin, antistreptococcic serum, the tuberculins (human and veterinary), until at this anniversary period the Mulford bacteriological laboratories furnish practically every known and used bacteriological remedy, all of them prepared with Mulford care and of Mulford quality.

A notable instance of the improvements made in bacteriological therapeutics is found in the work of the Mulford Veterinary Laboratories, on hog cholera serum, as they have succeeded after long and expensive experimentation in furnishing for the first time, two sera, one a potent, sterile serum, free from corpuscular debris, the other a trebly concentrated clear, potent sterile hog cholera serum globulin. The value to the community of this work alone is incalculable.

In 1908 the firm established a veterinary department to meet its very large and increasing veterinary business, and the Mulford combined Price-List and Visiting List, the *Mulford Veterinary Bulletin*, and the Mulford veterinary products are known and appreciated in all parts of the world.

The firm also publishes the *Mulford Digest*, dealing with problems of interest to the physician and bacteriologist.

Perhaps the most striking evidence of the growth, solidity and altruistic prescience of the company is to be found in the beautiful and complete biological and bacteriological laboratories at Glenolden, Pa. Here, on about one hundred and seventy-five acres of charming, rolling suburban country, watered by a clear, never-failing brook, and shaded by noble trees, the firm has built the most artistic and sanitary biological laboratories to be found in the world. No expense has been too great to make this plant at once ideally beautiful and useful, and it is most interesting to the visitor, passing from one complete unit to another, to observe that every provision has been made for the pleasure, health and comfort of the employees. Base ball grounds, tennis courts, dining hall, lecture room, rest rooms, testify to the firm's desire to make the work of its scientific staff as pleasant as possible, and we may add that a course of lectures are given every season, on subjects bearing directly or indirectly on the work in hand, many of the lecturers being scientists of national reputation brought to Glenolden at great expense.

On portions of this beautiful estate drugs are grown alike on a commercial and experimental scale, the firm being desirous to assure itself of the highest quality for use in pharmaceutical laboratories, and also to further the interests of pure science, by the endeavor to so cultivate the different plants as to increase their yield of active principles. This work is necessarily an expense, not a profit, and we may add that much of the work of the bacteriological, biological and pharmaceutical laboratories is devoted to the elucidation of

problems of purely scientific interest. As examples of these we are justified in mentioning the making of auto vaccines, from strains of bacteria furnished by the medical and veterinary professions, the manufacture of rare sugars used in bacteriological work, research work in chemistry and pharmacy, that almost never yields commercial results, although helpful to the science of medicine, the maintenance of a library, whose shelves are crowded with the best results of medical thought; and the training of its employees, by a source of lectures and demonstrations on scientific subjects, and in languages that may be useful to them in making a career.

The scientific staff is large, we believe we may say of national reputation, most of them are engaged in teaching departments of medicine in schools of the highest grade, they are voluminous and constant contributors to medical and scientific literature and they are absolutely untrammelled. Freedom of speech and thought is encouraged, and every facility is afforded them for research work of the most varied and advanced types.

As the business of the H. K. Mulford Company has grown it has been necessary to establish branch houses in convenient centers where full stocks of the Mulford products may be obtained, with a minimum of friction and delay, and the physician or veterinarian, whether in New York, Seattle, San Francisco, Mexico, London, Japan, Adelaide, or Buenos Aires, has equally ready access to the products of the house.

What of the future? What will be the extent? What will be the status of The H. K. Mulford Company when in 1941 it celebrates the fiftieth anniversary of the foundation of the house?

We cannot tell. This much however seems assured: the same policies will prevail, the firm will still clearly recognize that it is engaged in a useful, educational propaganda, doing whatever is possible for the advancement of medical knowledge and the encouragement of medical research, and so, on this our twenty-fifth birthday, with every assurance and every hope for continued progress of that great factor in medical, pharmaceutical, chemical and bacteriological science we leave you with best wishes.

BOOK REVIEWS.

A COURSE IN FOOD ANALYSIS, by Andrew L. Winton, Ph.D. First edition. New York: John Wiley and Sons, Inc., 1917. \$1.50 net.

Dr. Winton is well known as the author of several standard works on the microscopy of technical products and as an analyst of long experience. He has been well trained and understands very well what a practical course in food analysis should include. No one is better qualified to write a work of this kind and its appearance at this time is extremely fortunate. The object of the book is to equip the chemical student so as to become a professional food analyst. The value of a good microscopical course is not generally appreciated in courses in chemistry. The use of the microscope in connection with technical analyses is always of some benefit and not infrequently is of paramount importance.

Dr. Winton's book contemplates a course of forty laboratory periods, which supplementing the courses in qualitative and quantitative analysis, will furnish an adequate insight into the composition and microscopic structure of products needed in everyday life. There are ten chapters, which include the consideration of the principal food substances. They are as follows: (1) Introduction. (2) Dairy Products: Milk; Butter; Cheese; Condensed Milk; Ice Cream. (3) Meat, Fish and Eggs. (4) Natural Vegetable Foods and Mill Products, including Cereals; Legumes; Oil-seeds; Vegetables; Fruits; Nuts; Spices; Flour; Yeast and Baking Powder. (5) Microscopic Examination of Vegetable Foods, including Wheat Starch; Oat Starch; Bean Starch; Corn Starch; Potato Starch; Cassava Starch; Wheat; Rye; Oats; Corn; Buckwheat; Peas; Cotton Seed; Flax Seed; Black Pepper; Cayenne Pepper; Cinnamon; Ginger; Coffee; Cocoa; Tea and Mixtures. (6) Saccharine Products, including Sugar; Molasses; Syrups and Honey; Maple Products and Fruit Syrups. (7) Fats and Oils, including Edible Fats and Oils. (8) Fruits, Fruit Products; Liquors and Vinegars, including Fruit Juices; Wine; Cider and Other Liquors; Vinegar and Various Fruit Products. (9) Flavoring Extracts, including Vanilla Extract and Substitute Lemon Extract; Orange; Almond; Wintergreen; Peppermint and Spice Extracts. (10) Coffee; Tea and Cocoa, including Substitutes; Chocolate and Cocoa. The selection

of material is excellent and there is a very happy combination of microscopical technique and chemical methods of analysis. The students that will be most benefited by this work are the chemists, and this is probably the first time that a work has been published in this country which could be recommended generally for university and college courses.

HENRY KRAEMER.

SCIENCE AND LEARNING IN FRANCE, with a Survey of Opportunities for American Students in French Universities. An Appreciation by American Scholars. A Society for American Fellowships in French Universities. 1917.

This work is dedicated to the scholars of France, worthy custodians of their country's intellectual greatness. It is prepared in a time when France has reached the heights of moral greatness and is offered with heartfelt admiration and sympathy in the name of the scholars of America. The editor-in-chief is Dr. John H. Wigmore, of Northwestern University. He with a corps of authors have placed before the American public the contributions of France in all fields of scientific knowledge. The purpose of this volume is to show the status of France in the forefront of the world's progress and to furnish American university students all information bearing on graduate work in France.

Each chapter sets forth briefly, for a particular field: (1) The record of French scholarship during the past century; the notable achievements; the eminent leaders; the special lines of development; in general, the share of France in the world's progress. (2) The courses of instruction given, now or recently, at the universities of France, particularly at the University of Paris; the names of the most important scholars, with mention of their principal contributions and of the special fields of research over which they preside. (3) The facilities available for study and research, including the libraries, laboratories, archives, and museums, the auxiliary institutes, special schools, and learned societies and committees.

There is also an introduction, describing the general intellectual spirit of France and Paris, and the interest and attractions that capital and country offer to the foreign scholars; and an Appendix, describing the organization of French universities, the standards of preparation expected of the student, the system of degrees, the custom as to residence and attendance, the regulations as to fees and the like; and other facts useful to the visiting student.

The book has been made possible by the liberality of the Society for American Fellowships in French universities, which has borne all expense of publication.

The master minds of France have not only enriched their own country, but have stimulated, developed and sustained the best thought throughout the world. The American people have always been grateful and thoroughly appreciative of Lafayette and the other noble French men whose unselfish efforts made possible the establishment of this republic. Many of our institutions of learning have been modelled after the famous schools of France. The Philadelphia College of Pharmacy in its early days showed a strong leaning toward the French attitude in the development of the *Ecole Supérieure d'Pharmacie*. The *AMERICAN JOURNAL OF PHARMACY* was inspired by the *Journal de Pharmacie et Chimie* and for many years the prevailing abstracts were from French authors. The School of Pharmacy of Paris, with its group of eminent scientific men, is the leading institution of pharmacy in the world. "A notable figure is that of Guignard, pioneer in modern morphology, whose discoveries and technique in this field are surpassed in no laboratory. His material includes chiefly the higher plants, but associated with him is Radais, an authority in cryptogams. The whole range of plant morphology, therefore, is presented by these two investigators."

Similarly in chemistry we have Béhal, an organic chemist, who among other subjects, has studied unsaturated compounds and creosote, author of "*Traité de Chimie organique*" (2 vols., Paris, 1909-1911, 3d ed.); Gautier, known for various investigations in organic chemistry, in chemical toxicology, and in hygiene, author of "*Cours de Chimie organique*" (Paris, 1906, 3d ed.), "*Ptomaines et leucomaines*" (Paris, 1866), and "*L'Alimentation et les regimes chez l'homme sain et chez les malades*" (Paris, 1904); D. Berthelot, author of important researches on the theory of gases, the determination of molecular weights, and photochemistry; Moureu, a student of the rare gases of the atmosphere, and an eminent organic chemist, author of "*Notions fondamentales de Chimie organique*" (Paris, 1902); Bourquelot, whose researches upon enzymes are well known, author of "*Les Ferments solubles*" (Paris, 1896), Villers, Guimbert and Lebeau.

H. K.

INCOMPATIBILITIES IN PRESCRIPTIONS. For Students in Pharmacy and Medicine and Practicing Pharmacists and Physicians. By Edsel A. Ruddiman, Ph.M., M.D. Fourth edition, thoroughly revised. New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Limited. 1917.

Dr. Ruddiman's work is very well known and has met with great success. The subject is one of a fundamental character and Dr. Ruddiman has handled it very aptly. The arrangement is very excellent, so that when one meets with incompatibilities in prescriptions he can usually determine the nature of it, and provide a remedy. In the fourth edition a number of new remedies have been included and a number of prescriptions have been increased.

The table in previous editions, giving the average price charged for prescriptions has, through the courtesy of the editor of the *N. A. R. D. Journal*, been replaced by the schedule adopted by the National Association of Retail Druggists.

H. K.

WHITE'S VEST POCKET SUNDÆ FORMULARY. A collection of original and carefully selected standard formulas for the preparation of plain and fancy sundæes and the manufacture of dressings and toppings, arranged in alphabetical order so that they may be instantly accessible. Over 1,500 formulas. By E. F. White. 200 pages, 3 x 6 inches. The Spatula Publishing Company, Boston. Price \$1.

The author of this compact and handy little volume is the best known writer on subjects connected with the soda fountain in America. He says in his preface: "The time has come when a book is needed which the dispenser can carry in his pocket so that he may have instant access to simple directions for preparing hundreds of sundæes. There are so many he cannot possibly carry them in his head. The traveler from another city steps to the counter and asks if a sundæ popular in his city is served. Often all the necessary ingredients are at the dispenser's disposal, but he is compelled to say 'No,' when a glance into a pocket guide would enable him to prepare it, and thus give greater satisfaction to the customer. Again, this is the day of new things. People like something a little different and many dispensers like to put something new on their menus as a special every day or every week. This guide will give a new for-

mula for every day for four years or for every week for twenty-five years."

The book is certainly unique in that notwithstanding its great number of pages it is only about a quarter of an inch thick and may easily be carried in the vest jacket. Any dispenser who wishes to get out of the ruts will find this unusual book just the thing to help him accomplish his object.

NEW AND NON-OFFICIAL REMEDIES, 1917, Containing Descriptions of the Articles which have been Accepted by the Council on Pharmacy and Chemistry of the American Medical Association Prior to January 1, 1917.

We have in times past referred to this publication as a handy "little" volume, but if it keeps on growing and enlarging its sphere of influence, so to speak, this term will cease to fit it. We always look forward to the appearance of this book. It and the supplements appearing from time to time in the *Journal of the American Medical Association* are things that we have depended on for some years to keep us informed as to the newer remedies. Without this book on our work shelf we would feel lost. Not only will be found the newer remedies but also the most up-to-date results of investigations of the well-known and tried drugs known to scientific medicine.

When in search of information bearing on the therapeutic activity of new drugs and preparations in the interest of his medical clientele the conservative pharmacist will do well to consult this book. No claims are permitted in it that cannot be demonstrated as facts or backed up by reasonable evidence. In short, for the seeker after proprietary medicinal knowledge this book is a reliable and ready source of information.

The present volume, like its predecessors, is right up to date. On page 141 there is a full description of the Carrel-Dakin solution and the technic for making it, and on the preceding page a full description of sodium para-toluenesulphochloramine, or chlorazene, as it is sometimes called. This is really no new thing as it was made first by Chattaway in 1905.

JOHN K. THUM.

ANNUAL REPORTS OF THE CHEMICAL LABORATORY OF THE AMERICAN MEDICAL ASSOCIATION, Volume 9, January-December, 1916.

The volume under consideration is composed of reports of work performed the past year and not the least interesting of these reports are those bearing on "Wine of Cardui." From page 39 to 103 the analysis of this nostrum is gone into very thoroughly. The reports of more than nine different chemists are given in detail.

After careful reading of these one is convinced that the investigation of this much-vaunted preparation was thorough in every way and helped very materially in the great moral victory won by the Association in the suits brought against it by the Chattanooga Medicine Company. It is unnecessary to add that many of these analyses of "Wine of Cardui" were made by chemists having no connection with the laboratory of the American Medical Association.

Part I of this volume contains a reprint of a paper by W. A. Puckner, Phar.D., read at the Detroit meeting of the Association held in June, 1916. Dr. Puckner is the director of the laboratory. In this paper he relates very clearly and fully the scope of the work performed by the laboratory and its great usefulness to the medical profession, and that, despite the limited facilities at its disposal. Notwithstanding this the laboratory is glad at all times to answer all inquiries for information. In some of the problems brought to its attention, as for instance, those of a purely local nature, it tries to gain the coöperation and the investigation of such problems by city or state authorities.

It is becoming increasingly evident that the work done by this laboratory, to say nothing of the importance and usefulness of the Council on Pharmacy and Chemistry, is appreciated by the medical profession more and more every day.

J. K. T.

PHILADELPHIA COLLEGE OF PHARMACY.

MINUTES OF THE QUARTERLY MEETING.

The quarterly meeting of the Philadelphia College of Pharmacy was held June 25, 1917, at 4 P.M. in the Library, the President, Howard B. French, presiding. Sixteen members were present. Regrets were received from Joseph L. Lemberger and H. K. Mulford for inability to be present.

The minutes of the annual meeting held March 26 were read and approved.

The minutes of the Board of Trustees for meetings held in March, April and May were read by the Registrar, J. S. Beetem, and approved.

The Committee on Necrology, by its chairman, Professor Henry Kraemer, presented their annual report, giving in detail biographical sketches of Martin I. Wilbert, Samuel E. R. Hassinger and Frederick Gutekunst, members who had died during the year, when, on motion, the report was referred to the Committee on Publication (see AMERICAN JOURNAL OF PHARMACY, page 379).

REPORT OF DELEGATES TO THE PENNSYLVANIA PHARMACEUTICAL ASSOCIATION
MEETING HELD AT PITTSBURGH, JUNE 19-21.

In the absence of the chairman, Professor J. W. Sturmer, Dr. F. E. Stewart reported verbally that the meeting was a very successful one. The attendance was large, many interesting papers were read and the social features as usual were very much enjoyed. Dr. Stewart further said that one of the most discussed subjects was the status of the pharmacists in the army and navy. The rank and pay of pharmacists in the navy had been very much improved of late years, but for the army, there was much yet to be desired for the pharmacists. An interesting and instructive discussion followed the remarks of Dr. Stewart on this subject, which was participated in by Messrs. Beringer, French, LaWall, Kraemer, Lowe and Dr. Stewart. In this connection President French stated he had forwarded to army headquarters a series of resolutions that had been adopted applying to this subject, which had been acknowledged by the government in a reply by General Crowder in which he defined the present status of the pharmacists in the army and navy.

Report of the delegates to the New Jersey Pharmaceutical Association at its meeting held at Lake Hopatcong was made verbally by Mr. George M. Beringer. There was a very interesting program; legislation of state and national interest was largely considered. The illustrated lecture by Professor Kraemer and a paper by Professor E. F. Cook added much to the success and enjoyment of the meeting. Mr. Beringer further said the Association was a strong one, and very much alive and active in promoting pharmacy and the field was a good one in which to urge the advantages of the

Philadelphia College of Pharmacy to those seeking an education in advanced pharmacy.

Professor Henry Kraemer presented the bank book, cancelled check and correspondence relating to the contributions made by members of the College and others for Belgian pharmacists who had suffered from the present war. Also a letter from Professor P. van der Wieler acknowledging the receipt of the draft forwarded by Professor Kraemer, the treasurer of the fund, thus closing the account.

Mr. Beringer said he noted the absence of the dean, Professor Joseph P. Remington, because of illness, and moved that the Secretary be directed to convey to him the sincere regret of the members at his enforced absence, which motion was unanimously adopted.

President French alluded to the coming meeting of the Conference of Pharmaceutical Faculties to be held at Indianapolis August 27-28, and said the major faculty of the College were members of the Conference and that previously they had attended the Conferences only in an advisory capacity; that it was always understood that they were not to commit the College to any line of action.

President French then made the following appointments:

Committee on Necrology: Professor Henry Kraemer, chairman; Edwin M. Boring and C. A. Weidemann (reappointed).

Committee on Nominations: Professor C. B. Lowe, chairman; C. Stanley French, Mitchell Bernstein, F. E. Stewart and C. A. Weidemann.

Delegates to the American Pharmaceutical Association at Indianapolis August 27-September 1: Professor J. W. Sturmer, chairman; E. F. Cook, Henry Kraemer, Chas. H. LaWall, Frank X. Moerk, Freeman P. Stroup, Dr. F. E. Stewart, Charles E. Van der Kleed.

Mr. Beringer asked as to the status of these delegates, as it had been said that only delegates to the house of delegates would be recognized, to which the Secretary replied that for some years past the Secretary of the American Pharmaceutical Association had forwarded to him blank forms of credentials with the request to send the names of appointed delegates.

Professor Kraemer exhibited same handsome specimens of squill bulbs, and read the following letter:

NEW YORK, June 20, 1917.

Dear Professor Kraemer: The other day at the florist's who gets all my spare change, and some that I can ill spare, I ran across some bulbs of *Scilla maritima*, as it was so labeled by him, but I think it is now called *Urginea Scilla*. I took a few home and am sending you a couple, thinking you might care to try them. I don't know that they are a novelty, but I have never before seen them offered for horticultural purposes.

Yours cordially,

CASWELL A. MAYO.

The bulbs attracted considerable attention when Professor Kraemer remarked they were official squill bulbs, when, on motion, the Secretary was directed to convey the thanks of the College to Mr. Mayo for his gift.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

COMMITTEE ON NECROLOGY.

Probably never in the history of pharmacy has our profession been struck so hard by reason of the deaths of its members as during the past year. Our College has been among those thus afflicted and has suffered severe losses.

The death of Mr. Wilbert was so sudden it shocked the entire pharmaceutical world. He was in the prime of life, and just about ready to participate in some of the undertakings that would mean great advancement for American pharmacy. The appreciative memoir of Mr. Wilbert by Mr. Thum and which was published in the AMERICAN JOURNAL OF PHARMACY in February records the career of one of the Philadelphia College of Pharmacy's most ablest sons. The resolutions offered by various pharmaceutical, professional and scientific organizations reveal the esteem in which he was held by all of those with whom he labored.

FREDERICK GUTEKUNST.

Frederick Gutekunst, acknowledged as the dean of American photographers and who had a world-wide reputation, died on April 27, 1917. He graduated from the Philadelphia College of Pharmacy in 1853 and was at the time of his death the representative of

the oldest classes of the alumni. The name Gutekunst means "good art." His father came from Germany about the early part of the last century and settled in Germantown. After receiving a common-school education, young Gutekunst worked for Avery Tobey, a druggist at 1215 Market Street. While in this store he gave some attention to chemistry and electricity—the latter a science which had not then advanced much beyond electro-plating, electro-typing and telegraphy. Daguerreotypes, although they had been made for several years, were still regarded as great curiosities. Mr. Gutekunst conceived the idea of making copper electrotypes from daguerreotypes, and succeeded in doing so, though the process did not become of commercial value.

Mr. Gutekunst graduated from the Philadelphia College of Pharmacy in 1853, his preceptor at that time being William M. Powell, of Germantown, Philadelphia, Pa. He very soon gave up the drug business and took up photography as his life work. True to his name he became the world's most noted photographer. He began business at No. 706 Arch Street and later moved to 704 on the same street. In 1864 he moved to 712 Arch Street, where he remained in business until the time of his death; April 27, 1917. He also had a studio at 1700 North Broad Street.

Mr. Gutekunst had photographed more of the world's celebrated people than perhaps any man in this country. Among the personages who sat before his camera were Presidents of the United States, famous generals, ecclesiastics, actors and actresses, litterateurs and statesmen. He had received decorations from kings and emperors.

Among those whose portraits he made were the scientists, Lords Kelvin and Herschell, and Professors Tyndall and Leidy, Baron Takaki, Wu Ting Fang, Presidents Grant, Cleveland and McKinley, Generals Sherman, Meade, Longstreet, Beauregard, Hancock, Rosecrans and a full score more of the commanders on both sides in the Civil War; Admirals Read, Schley, Melville, Casey, McNair and Watson among the old seadogs who worried their country's enemies.

Clergymen who sat for him included Archbishops Bailey and Ryan, Bishops Phillips Brooks, Chatard, Foss, Davis, Fowler, Coleman, Kendrick, Hortsmann, McCabe, Potter, Simpson, Talbot, Whitaker, Walden, Bowman and a dozen more wearers of the purple of the church. Henry W. Longfellow, E. C. Stedman, Walt

Whitman, Bayard Taylor, Sir Edwin Arnold and Thomas Dunn English are among the poets in the Gutekunst gallery.

Edwin Booth and Edwin Forrest and Charlotte Cushman and the elder Salvini are stars in the histrionic constellation; Theodore Thomas and Damrosch, masters of music. Prince Louis of Savoy, Prince Ranjitsinhji and the Prince of Turin are among the representatives of royalty; Jay Cooke, Anthony J. Drexel, A. J. Cassatt and J. Pierpont Morgan, leaders in finance; Edwin A. Abbey and Benjamin Constant are among the artists in the collection.

Cardinals Gibbons, Satolli and Martinelli were among the princes of the Catholic Church whom he had photographed.

Besides many medals and honors awarded him at expositions, Mr. Gutekunst was the recipient of various testimonials in the way of gifts from rulers of nations and other eminent personages. Because of his famous panoramic picture of the Centennial Exposition, the Mikado of Japan sent him a pair of gold-lined bronze vases, King Victor Emmanuel of Italy a gold medal and Emperor Francis Joseph of Austria a decoration.

He also had in his collection autograph letters from many distinguished men, who wrote to congratulate him on his success in making their portraits. One of his letters shows that the name of Gutekunst had been carried even into the semi-civilized wilds of Africa. It was from the son of a king of the Zulu tribe. When Mr. Gutekunst read that a full-blooded African prince had carried off the George William Curtis first prize for oratory at Columbia University, New York, the photographer sent his own portrait of Mr. Curtis to the prince, who wrote to Mr. Gutekunst: "I can see clearly that you wish to teach me a great lesson. You wish me to carry back to my bush home the memory and life of this great American, in order that his bold stand for truth and for the great principles of living, and his wonderful wisdom, which is so well reflected in his inspiring countenance, may quicken our dark lives and give us manners, wisdom and power."

A eulogistic letter from the late Dr. Horace Howard Furness, the great Shakespearean scholar, was among Mr. Gutekunst's most valued possessions.

General Sherman wrote that with the Gutekunst photograph of General Grant before him it was next best to again seeing him in the flesh. Oliver Wendell Holmes wrote that he considered the portrait of Professor Tyndall as lifelike as his own. Grace Green-

wood wrote to thank Mr. Gutekunst for keeping alive the features of Charlotte Cushman. Professor William Ramsey, of the University of London, wrote that the portrait of Lord Kelvin surpassed in fidelity the portrait that was painted by Orchardson.

It was Mr. Gutekunst's practice to go home to lunch daily and eight weeks before his decease he sustained a fall while descending the steps of his residence to return to his place of business, 712 Arch Street. His wife, who was Sarah Coxe, died ten years ago. He is survived by two unmarried daughters, who reside with him, and a sister, Miss Mary Gutekunst.

SAMUEL E. R. HASSINGER.

Mr. Hassinger, one of the old-time modest and retiring druggists of Philadelphia, died suddenly on February 21, 1917. He was born in Halifax, Pa., September 17, 1845. He received his preliminary education in Pittsburgh and Oil City, in which two towns he also learned the drug business. He came to Philadelphia in September, 1868, receiving employment from Mr. John Connor, a prominent druggist of his day. As young Hassinger was ambitious to secure a higher education he matriculated at the Philadelphia College of Pharmacy, graduating in 1870. This was a famous class, as it contained the names of a number of men who afterwards obtained considerable distinction and met with unusual business success. Upon the death of Mr. Connor, he purchased the store at 23d and Fairmount Ave., and continued in active management until his demise. Mr. Hassinger was interested in pharmaceutical organizations and attended their meetings whenever his duties permitted. He was a life member of the Philadelphia College of Pharmacy, the American Pharmaceutical Association and the Pennsylvania Pharmaceutical Association. He is survived by his widow, daughter and son.

HENRY KRAEMER.

June 25, 1917.

CURRENT LITERATURE.

FRENCH INSPECTION OF NURSERY PLANTS.

David R. Lewis, St. Etienne, France, states that interest in the prevention and control of plant diseases and inspection by scientific officials under state authority is increasing in France. The number of horticultural establishments (nurseries) and vine growers who submitted to phytopathological inspections in 1916 were double those of 1914. The value of plants exported for these years to countries requiring certificates of inspection showed a corresponding increase even under the unusual conditions prevailing.

Nurserymen feel assured of the continued growth of these figures by the guaranty of the French government that buyers of other countries will be protected against dangerous parasites and diseases in plants imported from France.

The establishments submitting to control are divided into districts and expert service of inspection is furnished by entomologists and cryptogamists in charge of the director of the entomological station of Paris, the cost of the supervision being cared for by a small fee per annum for each nursery, and a charge made on plants exported. Efforts are now being made to greatly extend the service.

M. G. S.

PAPER PULP FROM AUSTRALIAN LALANG GRASS.

According to the *Indian Trade Journal*, March 2, a well-known agricultural and technical chemist in Queensland has conducted very successful experiments in manufacturing paper pulp out of lalang grass, commonly known as blady grass, on account of its great blades which are 4 or 5 feet long. It resembles very closely the esparto of Spain and North Africa, and when dried before making it into pulp yields as high as 60 per cent. of first-class paper-making pulp.

The expert states that esparto is the best pulp known and the blady-grass product is within 10 per cent. of the same value. There are millions of tons of this grass growing in Queensland. Three crops a year can be cut from it. Experiments are also being carried on with Chinese barr (*Urena*) and Queensland hemp (*Sida Retusa*), which produce 30 per cent. of first-class paper pulp. Lantana, which is regarded as a great pest, makes an excellent wrapping paper. Screwpine or pandanus, which also grows prolifically, is likewise being experimented with.

M. G. S.

IMPROVEMENT OF GUAYULE, THE DESERT RUBBER PLANT.

Much of the interest in the desert rubber plant, *Parthenium argentatum*, has centered at the Desert Laboratory since the publication by the Institution of Professor F. E. Lloyd's book on this wild plant. The volume in question (Carnegie Inst. Wash. Pub. No. 139, viii + 213 pp., 46 pls., 20 figs.), "Guayule: A Rubber Plant of the Chihuahuan Desert," embodies the results of an organized attempt to bring under cultivation a hitherto feral desert plant, together with an extensive ecological study of the same under normal and cultural conditions. Careful consideration is given to the question of rate of growth and reproduction of the guayule in its native habitat, and a large body of pertinent data is given. The various conditions of climate, soil, vegetational environment, and parasitism affecting the plant are presented in this connection. The life-history, habit, and anatomical and histological structure of the wild and cultivated forms are minutely described and compared, in order to secure exact knowledge concerning the relation between growth and the rate of rubber secretion.

The wild shrubs are collected in great quantities in Mexico and the rubber, which grades much lower than Para, is extracted by such simple processes as to make it a very profitable operation. The task of developing methods of cultivation has now been successfully accomplished by Dr. W. B. MacCallum and in making a genetic analysis of the plant he has established the fact that it includes a large number of elementary species which do not readily interbreed.

The company under whose auspices the experiments in cultivation were carried out has purchased 7,000 acres near Tucson, and guayule is now being established on this land. This effort is notable in that it is a successful attempt to bring a wild plant under profitable cultivation, and that it is the only rubber-producing plant within the borders of the United States.

BARIUM-FREE SALT.

ECONOMICAL METHOD OF ELIMINATING THE POISON FROM BRINE.

A method of removing barium from brine used in the manufacture of salt has been worked out by the Bureau of Chemistry of the U. S. Department of Agriculture. This method is now used successfully by one large commercial manufacturer, and it is believed will prove both profitable to other manufacturers and a safeguard to the consumer.

In a number of cases animals have been poisoned by salt made from the brines of the Ohio River valley in West Virginia and Ohio. This salt has been found to contain frequently considerable amounts of barium chlorid. The Bureau of Chemistry has fixed a maximum of 0.05 per cent. as a tentative standard for food salt. In practice, it has been found that what is known as No. 1 grade salt may contain from 0.02 to 0.23 per cent. of barium, and the barium chlorid content of No. 2 grade may vary from 1.02 to 10.75 per cent. The No. 2 grade is not ordinarily sold for table or dairy purposes, and in recent years it has been customary to label it "Not for food purposes," or "Do not feed to stock."

This naturally interferes with the demand for No. 2 salt and there is a great temptation for the manufacturer to dispose of it by substituting it for or mixing it with No. 1. No. 1 grade salt is the trade name for the product that first crystallizes out when the brine is evaporated in long, shallow tanks or grainers. After the impurities in the brine become too concentrated as a result of this process, the brine is run into other grainers and evaporation continued. The salt from the second grainers is called No. 2, or off-grade salt. There is no definite rule for determining when the production of No. 1 salt should cease and No. 2 begin, and there is, therefore, a temptation for the salt manufacturer to continue evaporation in the first grainers longer than the concentration of impurities in the brine warrants. The new method of getting rid of barium remedies this to a great extent by permitting a greater production of what can be truly called No. 1 grade salt. It also aids in the elimination from the market of salt that may be a dangerous product.

This method calls for the addition of a solution of salt cake (sodium sulphate), the acidity of which has been neutralized with a small amount of lime, to the brine in large settling tanks. Air is blown through in order to stir thoroughly the mixture and to decompose the bicarbonate of iron naturally present. This forms a flock and produces a rapid sedimentation of the insoluble barium sulphate formed. The cost of the treatment is estimated at about 1 cent per barrel of salt, which is more than offset by the increased value of the product. In one large salt factory this process has been in operation for over a year, and it has been found that only insignificant traces of barium remain in the No. 2 salt which is, therefore, a safe product for food purposes.

FACTORS AFFECTING THE YIELD AND QUALITY OF PEPPERMINT OIL.

The effect on the yield and quality of peppermint oil of cultural and climatic conditions is discussed in professional paper No. 454, by Frank Rabak, chemical biologist, Bureau of Plant Industry. This bulletin, recently published by the U. S. Department of Agriculture, is based on experiments in raising and distilling peppermint plants conducted from 1908 to 1912. Conditions of soil and climate, the author finds, are influential factors in the formation of oil and its constituents in the peppermint plant. Light sandy or loamy soil appeared to be most favorable for the production of an oil of high quality.

Distillation experiments were conducted with a view to determining the effect on oil yield of drying the plants previously to putting them in the stills. It was found that the yield of oil from fresh plants apparently decreases as the plant matures. Drying the plants before distillation results in a considerable loss of oil. The largest proportion of oil is found in the leaves and flowering tops. In experiments in distilling plants and parts of plants at different times of growth, the author found that the percentage of esters in the oil, which give the oil its fragrant minty odor, increases as the plants approach maturity. The menthol content of the oil bears a close relationship to the ester content. The free acidity and ester content of the oil distilled from dry plants is considerably higher than in the oil from fresh plants. The drying of the plants causes conditions favorable to making esters, while the percentage of free and total menthol in oil produced from dried plants is also uniformly high. It was found also that the formation of esters and menthol takes place most readily in the leaves and tops of the plants.

In another test it was found that the effect of shade upon the peppermint plant is to decrease the making of esters and the formation of menthol. Experiments with plants allowed to freeze indicate that frost noticeably increases esterification and the formation of menthol.

THE AMERICAN JOURNAL OF PHARMACY

SEPTEMBER, 1917

PLANT TEXTURES—"CONSIDER THE LILIES."¹

BY JOHN URI LLOYD, PHAR.M., CINCINNATI, O.

"Consider the lilies of the field, how they grow; they toil not, neither do they spin; and yet I say unto you, that even Solomon in all his glory was not arrayed like one of these."—Matthew 6:28, 29.

The Lily.—In this text the great Wisdom Master challenged not Solomon alone, but whoever sat in high places. And if in his estimation the mighty ruler, Solomon, was humbled in comparison with the tiny lily of the field, one might ask, who in worldly power can presume to glorify himself?

Through the passing centuries the artistic beauty of the modest lily of the field has ever brought confusion to the wearer of gorgeous raiment. Clad though he be in purple and gold, vainly does the potentate compete with a tiny plant that comes and goes in the solitude of a grass bound meadow.

While the lily as a whole, in its simplicity of leaf and the modest charm of its drooping, tiny white bells, bids even royalty be humble in its presence, we unconsciously accept that the Master's eulogy applies to beauty of blossom, of form, color and surface, only. Can our views not be enlarged? Is this limitation just?

Let us pass now to another Wisdom Book of the past, taking therefrom the text,

"All things are ceaselessly active; no man can enumerate all,
Nor can all be seen by the eye."²

¹ No claim is made herein to originality of facts. Taking for our text a tiny plant, our aim is but to lead thought in an informal way, step by step, to the immensity of the subject. But, for want of space, a fraction, only, has been introduced of the possible opportunity afforded by this plant. Inasmuch as the subject appeals both to pharmacy and medicine the author reserves the privilege of presenting the paper to readers in both fields.

² The Book of Ecclesiastes, by Paul Haupt. Johns Hopkins Press, 1906.

Hidden Charms.—Within the crown of each tiny cup on the spike of the lily of the valley,³ rests a structural marvel in which, in miniature, stamens and pistil are arranged in perfect symmetry, hidden from the casual observer. Resting in the shadows cast by the embracing leaves, content are the tiny bells to face, ever, the earth. Not one looks upward into the glare of the sun. Typical of modesty are they in that their hidden charm needs be sought by him who aims more fully to comprehend the Wisdom lesson given so many centuries ago.

Shall thought be restricted to floral beauty alone? Does not the Master's injunction, "Consider the lilies of the field, *how they grow*," include more than this? Are we not bidden to look beyond that which meets the eye?

"*How They Grow.*"—But for the humble, hidden earth stem (the rhizome), there could be neither leaf nor blossom. "In all its glory" the plant must depend for its bud and flower upon its earth-covered support. Creeping in darkness, content to do its part unseen, the root draws from the cold earth moisture and nourishment for the support of the structure that, in the breezes of heaven, enjoys the sunlight and the shade. When we consider "How they grow," the earth stem is all important.

Its Micro Lace Work.—Comes next to thought a questioning as to what lies beneath the skin, whether it be of root, leaf or flower. And in this questioning should we not also include the skin as a textural part of the whole? Does not the thinnest section of the plant of whatever part examined under the microscope disclose a network so exquisite as to eclipse even the beauty of the flower? So delicate is this as indeed, by contrast, to make even the flower-bell a clumsy piece of mechanism. In its tiniest fragments each portion of the plant presents a wonder-world to him who views this maze of the infinitely little. And as our viewpoint changes does not the scene shift? If the micro-slice be transversely made one phase of this exquisite mechanism is disclosed; if diagonal, another; if lengthwise, still another; each not less entrancing than the others.

"A mighty maze, but not without a plan."

And now comes to him who views such as this the marvel of it all. Perfect harmony in contexture exists between like sections of

³ This I accept to be the "Lily of the Field" of our text.

separated plants, be their home near or far, on mountain, plain or valley. Built of one pattern each yet carries in itself a distinct individuality. Nor is this all.

Wonders in Cell Life.—Pass that which can thus be seen, whether by the unaided eye, or in its micro-networks of lace. Are there not yet finer lines? Turn to the minute cells that make the lace-fibers. Each in itself constitutes an interlaced complexity. Behold them, in groups or singly, whether moving freely in the plant blood, or securely locked within the tissues. Beautiful structures are they, some transparent almost as water to the ordinary microscope, others shaded or colored green. Do not these tiny structures make possible the lily's growth? As they come and go, spring into existence, become fixed or burst and die, is not the plant guided to maturity from root to flower? Born into life but to die, their birth and death create and support the creature as a whole, that in turn gives to each transient cell a home in which to have its being and then pass away, much like the coral insect that makes of the masonry it builds, its tomb. Who that views these cell groups, too numerous for computation, too intangible in their development for human comprehension, too mysterious in their activities for the grasp of man's intellect, can but question further possibilities? Each cell is in itself a community of activities. Within it we discover structures such as nuclei and protoplasmic masses, each being a home in miniature in which the dwellers are as interlaced entities that play well their part. Can there be further wonders? Are there recesses yet to be explored? Did not Milton write:

"And in the lowest deep a lower deep?"

Life Points.—Grind to a pulp the living plant or any part thereof.⁴ Gone are leaf and flower and root. Burst the cells, mix their contents. Squeeze from the texture of the plant the juice that once coursed freely in its veins and rested in its cells, then filter. To the eye it is but as water; to the microscope that brought to view what we have previously seen, it is transparent and limpid. No cell, no fragment of material of any kind is visible.⁵

⁴To cover and digest with water a few fresh slices of any part of the plant is as satisfactory a process.

⁵In a lecture in 1890 before the New York College of Pharmacy, titled, "Infinites in Pharmacy," I attempted to indicate the relationship that existed between vegetable structures and manipulative processes. In this I emphasized coming possibilities, using this sentence: "Yet we know not what infinity of other results is possible to other forms of manipulation."

Turn now to the ultra microscope. Perfect transparency of solution by means of other light and methods here becomes as darkness. Focus the instrument in its highest power, in the bright illumination of the arc light on a film of distilled water. Absolute darkness prevails. Use next a film of this transparent juice of the lily of the field. Behold, a multitude of tiny, dancing points of light, each twinkling and revolving as though circling, planet-like, in an orbit of its own. Let us consider some phases of what now lies before us.

*Stars of the Infinitely Little.*⁶—So thin is the layer of juice in which these starry points appear, a mere film between two glass planes, that but for it they would rest upon each other. Yet so deep is it to the eye of the ultra microscope as to be in comparison a swirl of currents and eddies, much like a whirlpool in a lake. In this spin the tiny, glittering, diamond-bright points, possessed of motion of their own—an ever constant, twinkling whirl. They move where flows the current, which to them is a maelstrom. Ever active are they in their orbits, but, unlike bacteria, they have not power to resist the ocean in which they float. Comparable are they with the “star dust” of space. As in the “immeasurable great” the stars of heaven become brighter as the power of the telescope increases, so these tiny points, in the “infinitely little,” twinkle more brightly as the power of the microscope increases. So very minute are they that to focus those on the surface of the film is to lose those beneath. To bring to view those beneath the surface is to pass successively myriads that lie in the film’s depths. So numerous are they that although the field is but a pin-section magnified to the size of a dime, these sparkling, gyrating points are seemingly as numerous as before the telescope are the stars in the heavens.

Perpetual Motion.—Comes now the greatest marvel of it all. Never do these microscopic entities, in their natural setting, lose their motion. Preserve a portion of the juice and turn to it from time to time. Still do they whirl, twinkle, move on their axes. Death seems not to be their part. Almost might one accept that the molecule of life activity has here been revealed. The life spirit inherent in the minuteness of dead matter has seemingly been disclosed.

⁶ No claim is made to the discovery of the “Brownian Movements,” now so familiar to those concerned in physical chemistry. Our aim here is but to adapt these, as a link, to this story of the lily of the field.

Who would venture to presage the part that these vitalized ultimates, compared with which a microscopic cell or a bacterial segment is of mammoth proportions, take in the life functions that build the lily of the field?⁷

The Half Not Told.—Have we searched the innermost crypts, even now possible, in this attempt to present the story of the lily of the field? Let us ask. Have we herein mentioned the alchemy that creates either the exquisite perfume exhaled by the flower, or the active, toxic alkaloid contained in its structural root? Have we directed thought to the green pigment of the leaf or to the processes of the active cells that, in the sunlight, give to its verdure paint a useful setting? Have we considered the *function* of the pigment so essential to vegetable life? Have we noted the formation or function of dissolved juice content, such as sugar, or of cell content, such as acid or astringent? Have we attempted to show how “inorganic” becomes “organic” in the metamorphosis that forms this life tissue? Have we ever ventured to ask what lies in the transparent serum in which the star dust of micro-infinities dances, unseen by the eye even of the ultra-microscope, evasive to the most sensitive chemical reagent? Have we not ample reason to rest content in what is mentioned, accepting that “enough is enough?” May we not conclude that, in any study yet made of any plant of the myriads known, when one considers the possibilities outside our present limits, “the half has not been told?” Again let me quote from “*Infinities in Pharmacy*.”

“Painful as the admission may be we stand dumb before the mystery of the simplest plant in its living entirety.”

⁷ There are persons who view such studies as these as unnecessary to pharmacy. Likewise, there are those who consider plant pharmacy to be but a “rule of thumb” process in which the crudest churl stands shoulder to shoulder beside the deepest student.

THE CRUCIAL TEST OF THERAPEUTIC EVIDENCE.¹

BY TORALD SOLLMANN, M.D., CLEVELAND.

According to the good old truism, the last and crucial proof of the pudding is in the eating thereof; and so, the last and crucial test of a therapeutic agent is its consumption by a patient. There is, however, one essential difference: When the pudding is eaten, with a sense of satisfaction, we know that it was good, or at least an eatable pudding.

If the patient improves after taking a remedy, we do not yet know that he improved on account of the remedy. The *post hoc* type of reasoning or logic is not respectable; but it is all too apt to creep in unawares, unless one takes great precautions indeed.

Clinical evidence needs especially to be on its guard against this pitfall, for the conditions of disease never remain constant; nor is it possible to foresee with certainty the direction which they are going to take. It is just this point which makes the clinical evidence so much more difficult to interpret than laboratory evidence, in which the conditions can be more or less exactly controlled, and any changes foreseen. It is on this account, also, that clinical experiments must be surrounded with extra painstaking precautions.

In brief, while the "proof" of a remedy is on the patient, that is not the whole story, but merely an introduction. The real problem is to establish the causative connection between the remedy and the events. The imperfect realization of this has blocked therapeutic advance, has disgusted critical men to the point of therapeutic nihilism, and has fertilized the ground for the commercial exploitation of drugs that are of doubtful value or worse.

This has been impressed on me particularly by my service on the Council on Pharmacy and Chemistry. In the course of its work of passing on the claims advanced for commercial remedies, this council is forced to inquire critically into the basis of the claims of manufacturers.

It is interesting to note the qualitative differences in the evidence for the various kinds of claims: The chemical data are usually

¹ Read before the Section on Pharmacology and Therapeutics at the Sixty-Eighth Annual Session of the American Medical Association, New York, June, 1917, and reprinted from the *Journ. A. M. A.*, July 21, 1917, pp. 198, 199.

presented in such a form that it is possible to tell at a glance whether or not they are based on demonstrated facts, which could usually be verified or refuted without special difficulty. The deductions are usually such as can be legitimately drawn from the data, or else they are obviously absurd. All this agrees with the relatively exact status of chemical science.

In passing to data and deductions from animal experiments, a distinct change is noticeable: Not only are the data less reliable, and less worthy of confidence, but they are more often stated in a less straight forward manner. The presentation of the data often shows evidence of manipulations of the results, so as to make them most favorable to a preconceived conclusion that would recommend the drug. This is not always intentional, but is partly due to the less exact nature of animal experimentation, which leaves a wider play to the arbitrary interpretation of the reporter. A certain amount of this is unavoidable. No serious objection can be raised, provided the experimenter presents all the essential data, and discusses fairly all of the interpretations that would apply to them.

On the whole, it is usually possible to form a fairly definite estimate of the value of experimental data.

When one comes to the clinical evidence, an entirely different atmosphere obtains. When the Council demands evidence of the usefulness of a remedy, the manufacturers generally respond with every sign of enthusiasm. They may have ready a series of articles already published, or they instruct their agents to bring in letters from physicians. The last method seems to meet the most cordial response, judging from the deluge of letters and opinions that floods the Council.

The quality of the published papers is a fair reflection of the deficiencies of what is still the common type of clinical evidence. A little thought suffices to show that the greater part cannot be taken as serious evidence at all. Some of the data are merely impressions—usually the latest impressions of an impressionable enthusiast—the type of man who does not consider it necessary to present evidence for his own opinions; the type of man who does not even realize that scientific conclusions must be based on objective phenomena.

Some of the papers masquerade as “clinical reports,” sometimes with a splendid disregard for all details that could enable one to judge of their value and bearing, sometimes with the most tedious

presentation of all sorts of routine observations that have no relation to the problem.

The majority of reports obtained by the agents belong to these classes, notwithstanding the fact that they are often written for the special use of the Council, and therefore with the realization that they are likely to be subjected to a thorough examination, and therefore presumably representing the best type of work of which the reporter is capable. So, at least, one would suppose.

It is also possible, however, that some of these reports are written merely out of thoughtlessness, or perhaps often to get rid of an importunate agent. This is illustrated by the following correspondence, taken literally from the files of the Council.

A letter from a prominent physician "A," endorsing a certain preparation "D," having been submitted to the Council, the secretary was directed to write to Dr. A as follows:

"*Dear Dr. A:*—The B Company of C has requested the Council on Pharmacy and Chemistry to admit its preparation D to New and Nonofficial Remedies. As part evidence for the value of the preparation, the company submitted a letter from you which contains the following:

"So far as my experience has thus far gone, they are certainly superior to a number of other iodine compounds now on the market, and I should judge that they ought to take a superior place in therapy involving the use of iodine.

"The referee of the Council in charge of D writes that he was interested by your letter and asks that I inquire: As compared with sodium or potassium iodide, what would you say are the differences between, and real advantages of, D and the alkaline iodides? Did you make any comparative experiments and keep a record of them? If so, the referee would like to receive an account of your trials. In what direction could D be expected to occupy a superior place in iodine therapy?

"I hope that you can give the information asked by the referee and thus aid the Council in arriving at a correct estimate regarding the value of D."

The following reply was received from the physician in response to the foregoing:

"*Dear Professor Puckner:*—In reply to yours of January 19, I did not proceed far enough in the investigation of D to draw conclusions of any particular value for the purpose of the Council on Pharmacy and Chemistry; and I so stated in my letter to the proprietors of that remedy.

Answers to the questions you put in your letter require an amount of investigation of the remedy far beyond anything I undertook. As a matter of fact, I returned about five sixths of the capsules sent me, because of lack of time and opportunity to carry out the extensive clinical experiments that I plainly saw would be required to give an opinion at all worth while. I believe you had better not consider me in the matter at all."

The report was furnished by a physician for whom I have a high personal regard. I introduce it here, not so much in a spirit of criticism, but as a justification of the opinion that I have formed of clinical evidence obtained by manufacturers through their clinical adjutors.

When commercial firms claim to base their conclusions on clinical reports, the profession has a right to expect that these reports should be submitted to competent and independent review. When such reports are kept secret, it is impossible for any one to decide what proportion of them are trustworthy, and what proportion thoughtless, incompetent or accommodating. However, if this were done it is quite possible that such firms would find much more difficulty in obtaining the reports. Those who collaborate should realize frankly that under present conditions they are collaborating, not so much in determining the scientific value, but rather in establishing the commercial value of the article.

Often the best type of clinical reports—those in which the observations are directed to the significant events and not to mere side lines, and in which the significant events are correctly and adequately reported—generally lack one important essential, namely, an adequate control of the natural course of the disease.

Since this cannot be controlled directly, it must be compensated indirectly. For this purpose, there are available two methods:

The first is the statistical method in which alternate patients receive or do not receive the treatment. This method can usually only be of value when a very large series of patients is available. Even then, its value is limited or doubtful, because it cannot take sufficient account of the individuality of cases.

The second method consists in the attempt to distinguish unknown preparations by their effects—the method that might be called the “comparative method” or the “blind test.”

In this, the patient, or a series of patients, is given the preparation which is to be tested, and another preparation which is inactive, and the observer aims to distinguish the two preparations from their effects on the patient. Surely if the drug has any actions at all, it will be possible to select correctly in a decided majority of the administrations.

The same principle can be applied in distinguishing the superiority of one preparation over another. In this case, the two preparations would be given alternately to different patients, and the ob-

server would try to distinguish them by their effects. Here again, if one drug is really superior or otherwise different from another, to a practical important extent, the observer will surely be able to make the distinction.

This method is really the only one that avoids the pitfalls of clinical observation; it is the only method that makes the results purely objective, really independent of the bias of the observer and the patient. It is the only method, therefore, which determines whether it was really the pudding that was eaten and not some other dessert.

In principle this method does not usually offer any very great difficulties. It is, of course, necessary that the two preparations to be compared shall resemble each other so closely or shall be flavored, etc., so that they cannot be distinguished by their physical properties. This is usually not a very difficult matter. The method does not jeopardize the interests of the patient, for it is understood that no drug would be tested in this way unless there is some reason to believe that it has a value. When the patient's condition is such as to demand treatment, then he would be receiving either the standard drug or the drug which the experimenter believes may be superior to the standard.

CONCLUSIONS.

The final and crucial test of a remedy is on the patient; but the test must be framed so as to make it really crucial. Most clinical therapeutic evidence falls far short of this. The "blind test" is urged to meet the deficiencies.

CARREL-DAKIN SOLUTION.¹

By JOHN K. THUM.

It was while working on native black oxide of manganese, which chemical investigators before Scheele had studied more or less unsuccessfully, that he discovered in short order four new substances—chlorine, oxygen, manganese and baryta—and of these four, the first two have undoubtedly been of the utmost importance for the

¹ Reprinted from the *Journal of the American Pharmaceutical Association*, Vol. VI, No. 5, May, 1917.

proper understanding of chemical processes. This happened in 1774. Scheele termed the first substance "oxymuriatic acid"; thirty-seven years later, Sir Humphry Davy classified the first of these substances as an element and gave it the name "chlorine." Although Gay-Lussac and Thénard were the first to suggest that from its behavior it might be regarded as an element, Davy proved it.

The practical value of this discovery and the important rôle that chlorine has played in the development of chemistry cannot be overestimated, and now that its value as a germicide has been proved and its practical application made possible by the researches of Carrel, the danger of death from infection has been wonderfully reduced. Knowledge of the disinfecting and germicidal action of chlorine is not by any means recent. Chlorine water has been recommended for years locally as a stimulant and disinfectant for wounds and ulcers. However, its irritating nature and the severe pain produced when applied to wounds has militated against its general use in surgical procedure. Some years ago it was discovered that very attenuated solutions of this gas were efficient for the sterilization of swimming pools, but its use for this purpose has been discarded for the copper sulphate treatment of the water. Like in everything else the personal equation plays a very important part in the handling of chlorine gas for the disinfection of a swimming pool; while one man would exercise great precaution and care in carrying out the technic for the treatment of the water, others would be rather lax in varying degrees, with the result that while the water would probably be thoroughly sterilized, it would also be exceedingly irritating and painful to the eyes. In the copper sulphate treatment of the water this condition is not so prone to occur.

It may be of interest to know that as early as 1846 the disinfecting properties of chlorine were proven by the successful employment of it in eradicating an epidemic of puerperal fever in Vienna. In this case bleaching powder was used. Undoubtedly the ideal germicide for combating infection that occurs in most wounds is one that has the power of destroying not only bacteria but spores as well, and is only local in its action and, therefore, without danger to the host. It seems that the hypochlorites have this power. As a matter of fact they have been recognized by public health workers as the most potent germicides that we have, and yet their use in general surgery has been limited for reasons that are

obvious. The various hypochlorite solutions are all more or less unstable as to chlorine content and, while they can be made more stable by making them more alkaline, this militates against their use on the tissues.

The first practical application of chlorine in surgical procedure for the eradication and control of infection was undertaken by British surgeons shortly after the beginning of the great war. They immediately recognized their helplessness when the large number of wounded began to arrive from the front with wounds of every description and all terribly infected. They worked with hypochlorous acid in one-half per cent. aqueous solution, made by adding 12.5 grammes of chlorinated lime and the same quantity of boric acid to a liter of distilled water and allowing the mixture to stand over night. This was then filtered and used as a surgical dressing. In the *British Medical Journal*, July 24, 1915, p. 129, they give their results; while these are good, other workers seem to have been unable to duplicate them.

In their experiments they failed to take into account the extreme variability of chlorinated lime and this may be the main reason why results have been unsatisfactory in different workers' hands.

Dakin's solution then made its appearance. This is now referred to as Dakin's Original Solution. This solution is very easily made: 140 grammes of dried sodium carbonate are dissolved in 10 liters of water, and 200 grammes of chlorinated lime are added; the mixture is well shaken at intervals during one hour; the supernatant liquid is then siphoned off and filtered, preferably through paper. This solution is somewhat alkaline, but this alkalinity is modified by the addition of 40 grammes of boric acid. This preparation however, did not prove altogether satisfactory. Sometimes it worked admirably and at other times not. There were times that patients complained that the solution was very irritating and painful, although the original technic followed in its manufacture was always scrupulously duplicated. Of course, the fault laid with the chlorinated lime. While the formula was always rigidly adhered to, the chlorinated lime seldom had the 25 per cent. chlorine content that was required to make a 0.5 per cent. solution. When one remembers that the different brands of chlorinated lime available in the open market vary considerably, and that even different packages of the same brand will run all the way from 25 to 35 per cent. in available chlorine content (at least that was the range found by us

of packages put up in this country, and in Europe it must be greater, as the range of chlorine content of packages bought on the open market there run all the way from 20 to 37 per cent.), it is perfectly obvious as to why results should be so variable in different surgeons' hands.

Now Dr. Carrel's method for combating infection is simply a more or less continuous irrigation of the wounds with a modification of Dakin's solution, or, to be more exact, a modification of the well-known Labarrque's solution, officially known as *Liquor Sodæ Chlorinatae*. This official solution of sodium hypochlorite contains 2.5 per cent. of available chlorine and is markedly alkaline. This makes its use as a dressing for infected wounds prohibitive, it being exceedingly irritating and painful. Dilution of this solution with water to reduce it to 0.5 per cent. of available chlorine (the strength of the Carrel-Dakin solution) is impracticable, as it is still too alkaline. Such a diluted solution, first neutralized by the addition of boric acid, has been used but with very unsatisfactory results, it rapidly losing its chlorine, and proving otherwise objectionable.

Of course, making the preparation in this manner simplifies matters very much and also saves time, a factor of some importance where large quantities must always be available. It was Daufresne who pointed out the disadvantages of neutralization with boric acid, to which he attributed much of the irritation and painfulness, and the extreme variability of the chlorinated lime was also noted by the same observer.

Naturally, this illuminating fact put an entirely new aspect on the matter and brought forcibly to mind that estimation of the chlorine content of each new lot of chlorinated lime was absolutely essential before concordant results could follow.

Accordingly Daufresne evolved the following technic for making this preparation, and this only, and no other, should be used when Dakin's or Carrel-Dakin solution is called for:

Chlorinated lime (25 per cent. chlorine)	184 Gm.
Sodium carbonate, dried	92 Gm.
Sodium bicarbonate	76 Gm.

Into a 12-liter bottle put the chlorinated lime and five liters of water and shake frequently during a period of six hours; dissolve the two sodium salts in five liters of water and after six hours add this solution to the mixture of chlorinated lime and water and shake

well for several minutes. Allow to stand for at least half an hour until reaction is complete and then siphon off the supernatant liquor and filter through paper. The solution, undiluted, is then ready for use.

When the chlorine content of the chlorinated lime is above or below 25 per cent., the proportions of the three ingredients entering into this solution must be increased or reduced accordingly. To avoid the necessary calculation that this entails, Daufresne has prepared the following table:

QUANTITIES OF INGREDIENTS FOR TEN LITERS OF DAKIN'S SOLUTION

Titer of Chlorinated Lime.	Chlorinated Lime. Gm.	Anhydrous Sodium Carbonate, Gm.	Sodium Bicarbonate, Gm.
20	230	115	96
21	220	110	92
22	210	105	88
23	200	100	84
24	192	96	80
25	184	92	76
26	177	89	72
27	170	85	70
28	164	82	68
29	159	80	66
30	154	77	64
31	148	74	62
32	144	72	60
33	140	70	59
34	135	68	57
35	132	66	55
36	128	64	53
37	124	62	52

It would be well to take the titer of this solution occasionally. The same substances used for determining the activity of the chlorine in the lime are used for this purpose.

To ten mls of the finished solution add 20 mls of 10 per cent. solution of potassium iodide and 2 mls of acetic or hydrochloric acid. Measure into this mixture, drop by drop, from a burette, a decinormal solution of sodium thiosulphate until decoloration is complete. The number of mls used multiplied by 0.03725 will give the weight of the sodium hypochlorite in 100 mls of the preparation.

In order to determine the alkalinity of the Carrel-Dakin solution or note its freedom from caustic sodium, add to 20 mls of the solution 0.02 of phenolphthalein; if correctly prepared no red coloration should appear.

Estimation of the amount of chlorine in the chlorinated lime is of the utmost importance and the method for doing this is simplicity itself. One may use the method given in the U. S. Pharmacopœia, or the following, which is the one mentioned by Carrel in his note to the *Journal A. M. A.*, December 9, 1916, p. 1777, and which note is printed in the *American Journal of Pharmacy*, February, 1917, p. 84:

"Weigh out 20 grammes of the average sample, mix it as completely as possible with 1 liter of ordinary water and leave it in contact for a few hours, agitating it from time to time. Filter.

"Measure exactly with the gaged pipette 10 mils of the clear fluid; add to it 20 mils of a 1:10 solution of potassium iodide and 2 mils of acetic or hydrochloric acid. Drop a drop at a time into this mixture a decinormal solution of sodium thiosulphate until decoloration is complete.

"The number of mils of the thiosulphate solution required for complete decoloration, multiplied by 1.775, gives the weight of the active chlorine contained in 100 grammes of the chlorinated lime."

A WELL-EQUIPPED COLLEGE OF PHARMACY.

BY HENRY KRAEMER.

Pharmacy, like every other profession, requires for its just recognition by the public at large that all of its educational institutions shall be properly manned and fully equipped with everything that will make for the highest development of pharmacy at the present time. While this is true, the only way that this uniform progress can be attained is by the signal advancement of either some one school or college as a whole, or some one of their departments. There is no question but that the progress in one school is advantageous to every other, as every other school is desirous of not being found lagging. I think that this broad spirit characterizes educators in their work. He who would begrudge any institution of its having attained preëminence and a vantage point which is deserving of the felicitations of the best men and women shows a mean spirit and is not deserving of a place among the world's educators. It was with a great deal of satisfaction that I visited the College of Pharmacy of the University of Minnesota last winter, and saw its

new building, excellent laboratories and splendid equipment. It is now little more than twenty-five years ago that the dean of this college and I were associated as instructors in the College of Pharmacy in the City of New York. He at that time was an earnest student, filled with visions of a higher pharmacy and was called to build up the department of pharmacy of the University of Minnesota. It is always a source of satisfaction to see visible expressions of the fact that the dreams of a young man will come true, providing he works. Dean Frederick J. Wulling has labored hard and successfully and at the prime of life, with many years ahead of him, has an institution which is the equal of that of the best professional and technical schools anywhere. He has associated with him a group of men who will support him and will demonstrate to the regents of the University of Minnesota that their confidence in him has not been misplaced and that professional pharmacy is deserving of this support.

The new buildings were completed in 1913 and since that time the college has continued to grow. The pharmacists of the Northwest are to be felicitated that they have an institution of pharmaceutical learning that is adequately equipped and stands in the very front line of institutions of its kind in the world. From six students in 1892 with no fixed entrance requirements to over one hundred students in 1917, practically all four-year high-school graduates; from the meager appropriation of \$5,000 in 1892 to an appropriation of \$75,000 in 1911; from a property value of about \$2,000 in 1892 to a property value (personal and real) of over \$300,000, inclusive of sites, in 1911; from a few instructors in 1892 to an active working faculty of twenty-seven, with every member of which every student comes in contact; from no special lecturers in 1892 to fourteen in 1911; from a single room in which lecture and laboratory work was carried on in 1892 to a fine large four-story building, 61 x 115 ft. in dimensions, in the erection and remodeling of which for the College of Pharmacy over \$100,000 has been spent up to the present; from a fairly good curriculum in 1892 to one which is comparable with the best now; from comparatively little research work in 1892 to a fair volume of such work now; from an attempted medicinal plant garden in 1894 to a real drug garden of several hundred medicinal plants and to a plant house 31 x 60 ft., devoted to economic plants; from a precarious existence within the few years following organization, during which period

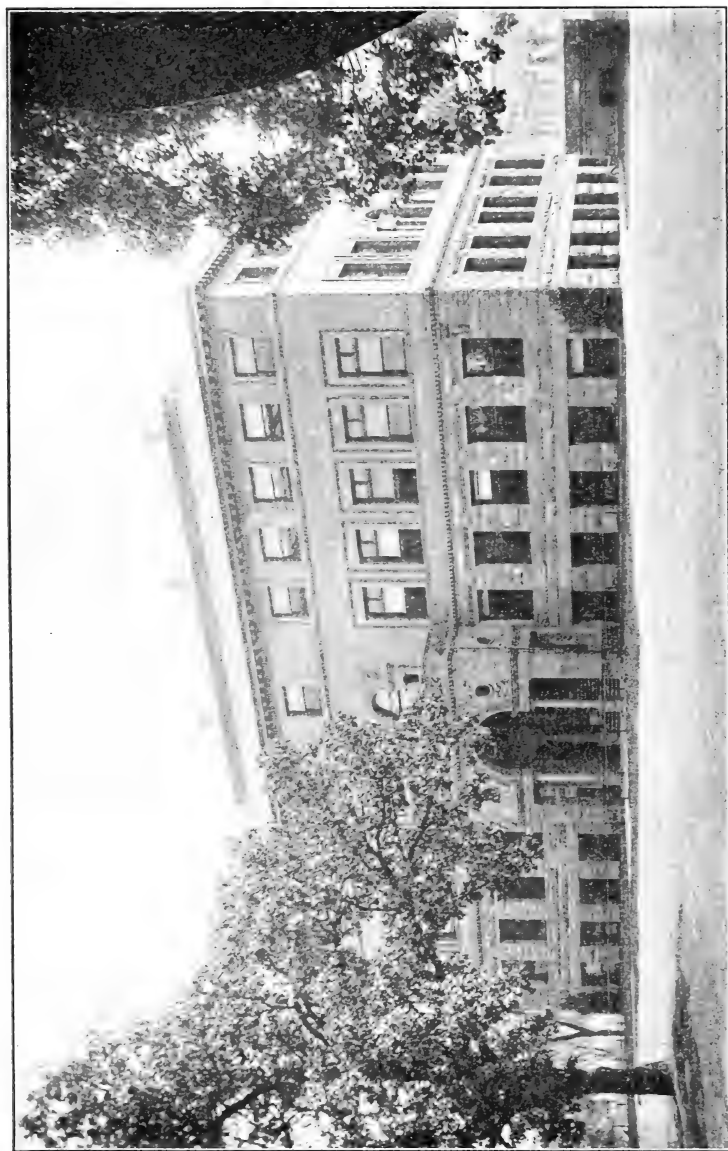


FIG. 1. The College of Pharmacy, University of Minnesota, Main Building, showing corner of Medicinal Plant Laboratory to the right.

the very life of the college was in the balance continually because of the hostile attitude of the medical college and the indifference of the regents, to a firm, substantial, recognized and unmenaced position now; from the position of an unrecognized, unwelcomed outsider in 1892 to a fully recognized, to be-reckoned-with and representative member of the university family in 1913, is a record with which any man can be well satisfied. Since the college emerged from the pioneer period, it has steadily gained in momentum, so that it sees itself now on the way to much more substantial and accelerating development and achievement within the next decade.

The new building with its equipment cost approximately \$110,000. The building is 60x115 feet in dimensions and full four stories high, entirely fireproof and equipped with eight connections on each floor for hot and cold water, steam under pressure, gas, electricity for light and power; air pressure; vacuum cleaning system; elevator; steam heating with thermostatic control in every room; direct illumination in the laboratories and halls and indirect illumination in the lecture and recitation rooms, library and offices; sanitary drinking fountains; electric fan ventilation in every large room; intercommunicating telephone system; electric clocks in every room regulated from a central system; four toilet rooms and a women's retiring room; metal weather strips and metal screens on all windows; washable window shades with additional black opaque shades for the lecture room and recitation room for lantern work; eight sockets on each floor for electric motor attachments for motors varying in power from $\frac{1}{8}$ h. p. to 10 h. p.; attachment for projection apparatus in the lecture room and two laboratories; alberene stone sinks; fire protection on every floor, etc. The building was constructed by erecting within the old stone walls a strong steel skeleton for the walls, floors and roof. The floors are constructed of tile set in between steel crossbeams. A substantial grouting covers the tiles and something over one inch of solid finish cement over the grouting. The cement floor is covered with a special cement paint, giving a very smooth and sanitary floor. The thick paint consisting of several coats takes away much of the hardness of the cement floor.

A central hall divides the building on all floors into two equal halves. The west half of the full-height and fully lighted basement is connected with the adjoining medicinal plant laboratory by a tunnel. This half of the building is devoted to a commercial pharma-

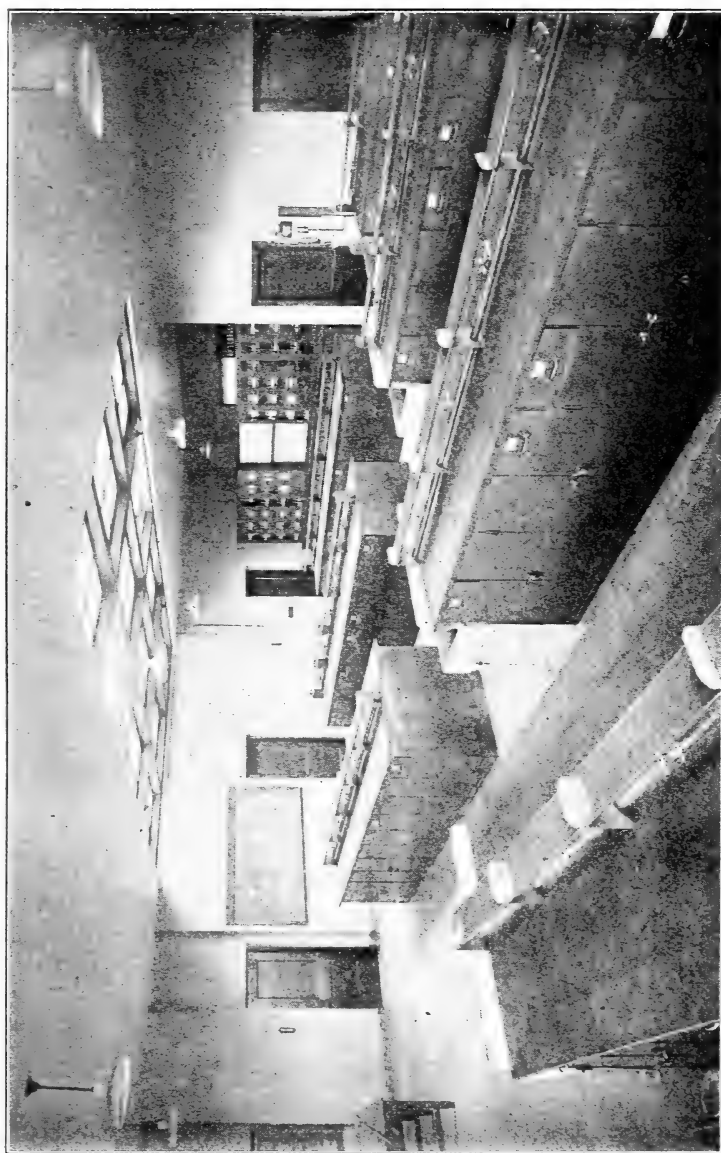


FIG. 2. One of the Pharmaceutical Laboratories, College of Pharmacy, University of Minnesota, showing the enamel steel furniture equipment and large skylight.

cognosy laboratory, a students' lunch and locker room, and a suite of three rooms for photographic purposes consisting of a dark room, a developing room and a camera room. The photographic department is furnished with an arc lamp, mercury lamps, and with other equipment required for general photographic and micro-photographic work. The east half of this floor contains a large pharmaceutical manufacturing laboratory for the rougher work, a locker room and a storage room. There are two front entrances and three rear entrances to this lower floor. The central rear entrance leads into the sub-basement unpacking room, from which room shipments and material are distributed to the respective parts of the building by the elevator, which has its lower terminus in this room. Nearby a room supplies space for acids and inflammable chemicals and in one of the angles of the room the motor for the vacuum cleaning system is placed.

The first floor contains the lobby, which is lighted from the ceiling by a cluster fixture. The main clock is located here. The floor of this hall as well as of the upper halls is of tile. The east half of this floor contains the library, the dean's offices and private laboratory. In the west half is located the pharmacognosy laboratory proper and a preparation room and an office. The west half of the second floor contains the lecture room, the east half a smaller lecture room and the dispensing laboratory and stock and preparation room. The third or top floor is devoted entirely to laboratory purposes, the west half containing the pharmaceutical chemistry laboratory with preparation and stock rooms and the State Board of Pharmacy stock room. The east half is taken up by the pharmaceutical laboratory with adjoining stock and preparation room and balance room. The upper floor is lighted not only by large windows, but by a ceiling skylight as well. The roof is entirely fire-proof, of steel and concrete construction with slate shingles, the whole surmounted by a lantern skylight containing three large ventilators to ventilate especially the two upper laboratories. The spacious room in the attic is utilized for the drying or curing of drugs from the drug garden.

The furniture equipment is almost entirely of steel, consisting of steel work-tables, cupboards, lockers, cabinets, shelves, hoods, drug bins, animal cages, library stacks, etc. The steel furniture is made of a heavy gauge steel covered with an olive green baked-on enamel. All tops are of cypress stained black to withstand the action of acids, alkalies and chemicals generally.

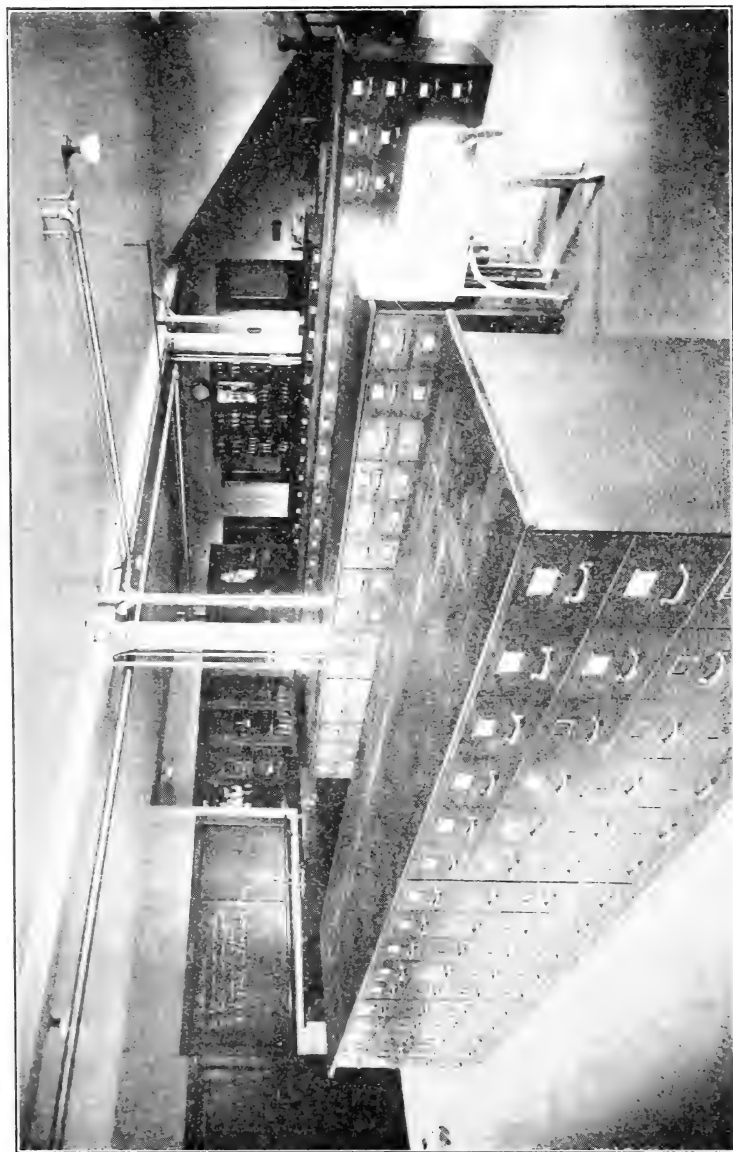


FIG. 3. Commercial Pharmacognosy Laboratory, College of Pharmacy, University of Minnesota, showing the steel cases with dust proof drawers for storing crude drug stock.

PHARMACEUTICAL DEPARTMENT.

As has already been stated the department of pharmacy with its lecture and recitation rooms and laboratories occupies the entire third floor and a part of two other floors. The laboratories cover a floor space of approximately 11,000 sq. ft. The laboratories on the third floor are fitted out exclusively with specially designed and most modern steel furniture, including students' work tables in the center of the laboratories, cupboards, drawers, enclosed shelving, hoods, wall cases, steam and sand baths, along the outer walls. This steel furniture is covered with olive green baked-on enamel, rubbed down to a smooth surface. The locker and drawer handles and label holders are of solid brass. The laboratory in the east half of the top floor has easy access to a balance or weighing room and a stock and preparation room. The latter is separated from the main laboratory by a unique steel case 25 feet in length, 3 feet wide and about 10 feet high, with a central opening of four feet above the top, which serves as a students' supply window. The side facing the main laboratory is provided with shelves enclosed with glass doors on which pharmaceuticals are placed for exhibition purposes. The lower part of the inner side of the case consists of cupboards for storage purposes. The upper part consists of shelves for tincture and other display bottles. The preparation room has direct access to the elevator and is supplied with an alberene stone sink and drainboard and on the south wall with a series of thirty drawers for laboratory supplies, utensils and storage. Over these drawers are a series of shelves for stock bottles, etc. The weighing room, about 16 x 12 feet in dimensions, is provided with suitable supports for balances so made and placed as to reduce vibration to the minimum. The construction of the building is so solid and substantial that very little vibration is felt anywhere, even while the trains, not 200 feet distant, pass by.

The main laboratory of the east half of the top floor provides steel working tables for eighty students working at one time. Each student has a locker 3 feet 4 inches high, 18 inches wide and 2 feet deep, containing an adjustable shelf, another locker 2 feet 8 inches high, 18 inches wide and 2 feet deep and over this an 8 inch deep drawer provided with side suspensions, insuring easy operation of the drawer and keeping it always level in any position. The table space assigned to each student is three feet wide by two feet deep. The table tops are of cypress covered with a special acid and stain

proof preparation. Running lengthwise over the tops of the tables in the center is a steel shelf eight inches high, affording room for reagent bottles. Under this shelf runs the $1\frac{1}{2}$ inch gas main, supplying each student with gas for fuel purposes from the two lever gas cocks.

Each of the eight students' work tables provides room for ten students at one time. At the end of four of these long tables are located alberene stone sinks, 2 feet by 4 feet in dimensions, provided with hot and cold water, steam under pressure and water and hose connections. Each pipe has a shut-off below the sink. On the inner hall wall are located a six-foot alberene stone sink, the lecture or demonstration table on a platform, a spacious slate blackboard, cupboards surmounted by percolating racks, and a sand and steam bath.

The lecture table is provided with hot and cold water, gas, steam under pressure, electric current and air pressure. Over the lecture table and elsewhere in the laboratory are located pulleys for the exhibition of charts. The main hood, which is made of steel, is found in the northeast corner of the room. The central portion reaches a height of about nine feet and to each side a wing is attached, located under the high windows, but high enough to serve as fume chambers. These wings empty into the central portion of the hood, which is exhausted at the top through the window at the north side of the building where current is created by an exhaust fan operated by a motor. This hood, like all others in the building, has cupboards below, covered with soapstone. All portions exposed to fumes are asbestos lined and painted over with a special fume and acid proof preparation. This laboratory has no posts in view. All of the supply pipes, such as hot and cold water, steam, gas and the waste pipes, are brought up through the floor from the ceiling below, where attachment to the various supply pipes is made. The floor of this laboratory, like all other floors in the building, has a top coating of an inch and a half of cement and is provided with floor drains so that the entire floor can be flushed. It is not the purpose to flush the floor, except possibly in parts, but in case the water leaks anywhere it will drain off into the sewer. This is true of all the floors in the building, each floor having four large floor drains. All floors are covered with three coats of special cement paint.

This main pharmaceutical laboratory is lighted by twelve electric ceiling fixtures, the eighteen-inch shades of which are of white

enameled steel, fitted with clusters of four tungsten lamps of sixty watts each, affording a very brilliant illumination on dark days or late afternoons during the winter months. The day lighting of this laboratory is excellent. The wall windows are numerous and large and in addition there is a very large ceiling skylight admitting a flood of light. The frosted glass in the ceiling skylight prevents the glare of direct sunshine, which however rarely strikes this ceil-



FIG. 4. Medicinal Plant Laboratory, College of Pharmacy, University of Minnesota, interior view, showing arrangement of plant benches and aquatic pool.

ing skylight directly since the light must first pass through the roof skylight. On this account there is for the most part a soft diffused light in the room. This and all other laboratories are connected by an intercommunicating telephone system with the Dean's office. One of the nine electric clocks provided for the building is located in this laboratory. The laboratory is entered from the central hall by three doors affording ample ingress and egress. It is ventilated through the skylight, two special devices affording easy means for the opening of the three large copper ventilators in the

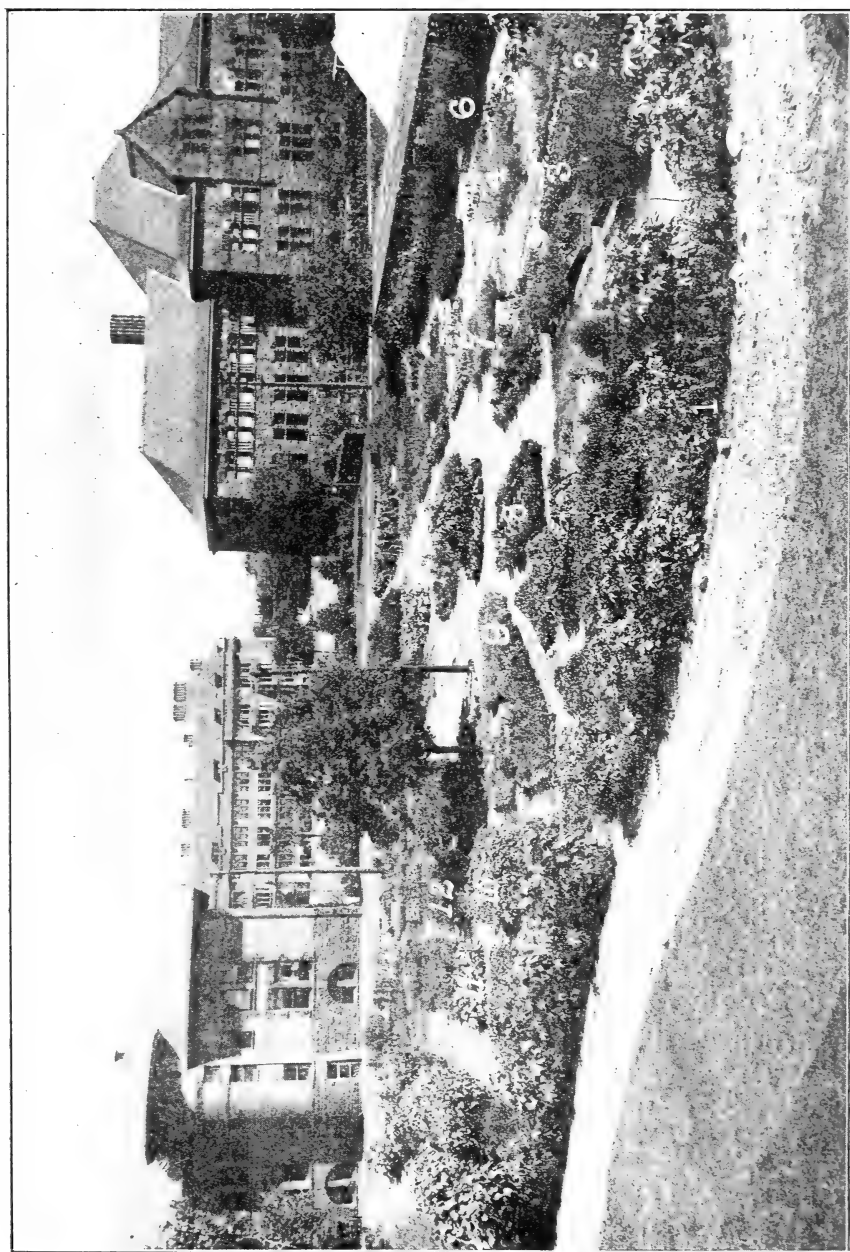


FIG. 5. Medicinal Plant Garden, College of Pharmacy, University of Minnesota.

lantern of the roof. Electric current attachment for motors up to 5 h. p. is provided in four convenient places in this laboratory.

The laboratory occupying the west half of the third floor is planned and furnished identically as the laboratory just described, with the exception that it contains an additional small room on the south side to be used for weighing purposes, the space for which has been taken from the preparation and supply room. In this laboratory a room is provided for the Board of Pharmacy in which to store its supplies.



FIG. 6. Slat House for Shade Loving Plants, Medicinal Plant Garden, College of Pharmacy, University of Minnesota, showing hydrastis, podophyllum and cimicifuga in the foreground.

The subjects in which pharmaceutical work is carried on include the physics of pharmacy, pharmaceutical processes, operative pharmaceutical chemistry, junior and senior operative pharmacy (both organic and inorganic), U. S. P. testing, quantitative analysis of U. S. P. salts in preparations, National Formulary work, Pharmacopœial assay, dispensing and study of incompatibles and

the identification of pharmaceuticals. There is a thorough coördination of the work in the several departments, so that the preliminary work in connection with the making of galenicals is carried on in the department of pharmacognosy.

DEPARTMENT OF PHARMACOGNOSY.

Under the title of *Materia Medica*, the department devoted to the study of crude drugs was limited in its scope and was not expensive to maintain. This department, which formerly dealt in generalities, is now happily replaced by a department of fact and practice, viz., pharmacognosy. This latter department requires many facilities and an outlay of money to maintain it properly. The first prerequisite in such a department is a medicinal plant garden. In this the student should become acquainted with growing plants, and if he is required to collect the drugs, making assays upon them and preparations from them, he will understand why preparations vary in strength and are frequently inert. The medicinal plant garden of the University of Minnesota covers 50,000 sq. ft. and is under active cultivation, containing most of the official drug plants and several hundred unofficial drug plants. The students are required to examine the growing plants, later collecting the drug portions, drying them, powdering them and making preparations from them. In addition to the medicinal plant garden, the school has a large greenhouse adjoining the pharmacognostical laboratory. In structure it is like a palm house, allowing ample room for growing tropical medicinal trees.

The department is well equipped with facilities for drying drugs and has a large milling laboratory. The equipment includes large drying ovens, 10 h. p. motor, shaftings and pulleys, drug thresher, fanning mill, disintegrator mill, limited mill, gyrator sifter, small motors and small drug mills, steel carriage drug bins and work tables. A part of this floor is devoted to inclosures, especially designed and constructed of steel for guinea pigs, rabbits, roosters and other animals for physiological drug testing. Storage bins of steel are provided for pots and soil. The wash room and mechanical room, containing the switch boards, steam trap, tool bench, etc., occupy the north end of the floor.

The plant laboratory building is provided with hot and cold water, high and low pressure steam and a conduit laid in concrete

for electric light, power, exhaust fans, class bells and telephones. The construction throughout is of concrete, brick, steel and glass and its architectural simplicity presents an exceedingly pleasing aspect.

A passageway leads directly from the milling laboratory to the commercial pharmacognosy laboratory on the ground floor of the main building. In this latter laboratory are steel cases with tightly fitting covered drawers. These cases, with about 500 drawers, hold the main vegetable drug stock. The tops of the cases are used by the students for work in drug garbling and identification. A vacuum drier, steam distillation outfit and other extraction apparatus are located along the west side of the laboratory. Space for sterilizers and special apparatus and desk room for special students is provided along the south side.

A suite of rooms for photographic work adjoins the commercial laboratory, including dark room, camera room and printing room. Facilities are also provided for the making of reproductions by means of the Edinger drawing apparatus. Other apparatus already in use includes a large plate camera and a micro-photographic camera. The dark room is provided with all the facilities necessary for the preparation of autochrome negatives showing the true color of medicinal plants or other objects.

The main pharmacognosy laboratory is situated on the first floor, directly over the commercial pharmacognosy laboratory, with which it is connected by a broad stairway. The laboratory is furnished with specially designed students' desks for microscopical work and each desk is provided with closets for simple and compound microscopes, drawers, micro-chemical reagents, permanent slide collection, and collection of authentic powders in sprinkle-top bottles. Both natural and artificial light are available for use. A long blackboard and demonstration desk occupy one side of the room and cases are provided for charts, maps, pharmacognosy models, drug specimens, etc. A part of the room is reserved for herbarium work and cases for other botanical specimens. Splash sinks are located at convenient places. A stock and preparation room is located on the south side of the laboratory for the preparation of special microscopical mounts and for storing microscopical accessories, reagents, etc. A projection lantern for microscopic, opaque and lantern slide work has been installed in the main laboratory so that any difficult part of the work may be clearly elucidated during laboratory in-

struction. The special equipment includes: polariscopes, microspectroscopes, a large sliding microtome, centrifuges, extraction apparatus, apparatus for physiological work, balopticon, etc.

LIBRARY.

Reference books and journals are absolutely indispensable in a teaching institution. Fortunately the conditions at the University of Minnesota are such that each department has its own library. In the College of Pharmacy it occupies the greater part of the east half of the first floor of the building and includes a floor space approximating 1,600 square feet. The library is admirably situated, so far as lighting is concerned, since it has a southern exposure of 44 feet with four very large windows and an eastern exposure of 37 feet also well lighted by four large windows, each measuring 5 x 7 feet. The windows are supplied with shades almost exactly matching the very light brownish yellow painted walls, giving a very pleasing lighting effect, which is calculated to relieve the eyes as much as possible from strain from library work. The shades are of an imported material made at Lancaster, England, and are washable on both sides.

The steel library stacks which are so placed that the light from the spacious windows can be most fully utilized, are of the very latest construction, thoroughly braced in the center and on the top, thus affording a very rigid and substantial fixture. The shelves are adjustable. The width of the double stacks is 16 inches and of the two large double stacks for journals and large volumes is 21 inches, all of a height of 7 feet, 6 inches. The stacks afford 1,680 running feet of shelving, 11½ inches in height. Since most books are less than nine inches in height and as the shelves are adjustable, the total number of running feet for all sizes of books approximates 2,000. The stacks are of a heavy gauge steel with curved corners, a substantial base and an ornamental cornice of olive green, baked-on, rubbed-down, enamel finish. The passageway between the stacks approximates 3 feet, with two substantial equidistant electric lights in the center to facilitate book work at night. In addition to this direct lighting between the stacks, there is abundant provision for the indirect illumination of the entire room from the ceiling. The floor of this room is of cement, covered with a special cement paint.

QUARTERLY REVIEW ON THE ADVANCES IN
PHARMACY.

BY JOHN K. THUM, PH.M., LANKENAU HOSPITAL, PHILADELPHIA, PA.

America's entrance into the Great War continues to be the great topic, and the cause of unprecedented activity and preparations for preparedness, in all walks of our daily life.

Top-notch efficiency for the conduct of the war will only be obtained by selecting and utilizing those of our citizens who are especially fitted and trained to look after the welfare of our youth who must make this fight for us. Not only must the best brains of the country be brought forward to train them in all the newest methods that have been developed in modern warfare, but the best that we have in medicine and surgery—and particularly preventive medicine, hygiene and the latest and most improved methods of sanitation—must be utilized and placed at the disposal of the young men of our country who will be called upon to make the great sacrifice. Men who are willing and prepared to give their life for their country—and no sacrifice can be greater—should at least be made to feel that everything that is humanly possible is and will be done to prevent disease and give that medical and surgical attention to the wounded that is so vital and necessary.

And this brings to the rôle that the pharmacist must play in this great drama and tragedy, for it is all of that!

There has never been any great number of pharmacists in our army because of the fact that they can only enter as a private or enlisted man and never rise to any greater rank than to that of a non-commissioned officer. It is needless to say that this is a strong deterrent against enlistment of young men who have had the advantages of a good preliminary as well as a good scientific education. And for this reason, and no other, the fighting men of our army have had to submit to the dispensing of medicines by men who are not qualified to perform this important function.

We believe we are right in making the statement that the bulk of the dispensing and pharmaceutical work is done by ordinary enlisted men who have about the same qualifications as an ordinary hospital orderly or male nurse. Surely the men in the field are entitled to better than this! In civil life the pharmacist stands between the

patient and the physician. If the physician should by chance write for an over-dose of a potent medicine—and there are cases in which he has been known to do that very thing—the law holds the pharmacist responsible. Has the soldier of the regular army the same protection? Will our sons and brothers who have volunteered and been selected for the new National Army have every safeguard in this respect? We are constrained to utter an emphatic no! Not if the present method of medicinal administration is continued.

As for pharmaceutical work, there certainly can be none, or at best, very little done. The army physician must rely very largely on manufacturing pharmacists for practically all of the pharmaceutical preparations prescribed by him. Is he capable of assaying these? And would it be possible for him to find time for such work even if he were capable of such work? Will he find time to make any of the simplest tests for chemicals, etc.? Even now we hear it rumored that the government is experiencing much difficulty in getting the adequate quota of doctors for the first army.

Granting that the army will be able to mobilize the necessary number of physicians, experiences related by keen observers from the theatre of war teem with information as to the busy times the medical men are having and the tremendous strain that the whole field of medical and surgical organization is subjected to. Under such conditions it will be absolutely impossible for the medical men to interest themselves in the drug supply of the army and neither should the government expect it of them. It is not right that they should have this burden put on them and the sooner it is removed and placed where it rightly belongs the better for the fighting men of the army and the medical men themselves. To right thinking men and women the logical solution of such an anomalous condition is proper organization of the pharmaceutical ability of the country for service in the army. If physicians, dentists and veterinarians are given recognition for their special ability and training, by the government, why may not the same official recognition be given to the men of the pharmaceutical profession? In no period in the whole history of the world was it ever more necessary for the intelligent coöperation of service and special ability than it is in this epoch-making time. It is the solemn duty of a nation to take special care of the health of its fighting men, and the people of this country should demand that Congress enact the necessary legislation for the creation of a pharmaceutical corps of the army. Such an act, pro-

viding for commissions as officers, would attract to the service men, whose scientific ability and technical training as pharmacists could be utilized in many ways.

It is gratifying to note that following their accustomed initiative, the allied pharmaceutical organizations of Philadelphia have combined to form an organization to bring about this very thing. This organized body has been named the Pharmaceutical Military Association.

There is also cause for gratification in the fact that the Journal of the American Medical Association favors the organization of such a pharmaceutical corps and in a recent editorial points out the advantages its creation would bring to the medical men of the army. In a recent communication to the New York Medical Journal, Dr. J. Madison Taylor puts the case so well for the pharmacist that we quote him as follows:

"We have no desire to be hypercritical of the Medical Department of the army and navy—we realize fully the serious burdens they are carrying—but in my judgment there is grave peril that in the near future the demands upon the military medical service will be so many and serious that it might break down from overwork. It is to prevent this, to anticipate, that we make the constructive suggestion that steps be taken immediately to provide a sufficient number of assistants skilled in all branches of service required for the Medical Corps.

"There are several ways through which this assistance can be given—by utilizing medical students by utilizing nurses, and by utilizing pharmacists. The first is economically, unwise, because medical students are potential physicians and surgeons, and will be needed later on to take the places of the medical men now in the service. The second is objectionable by reason of the limitation of a nurse's training along medical lines and also her sex. The third is the most promising, because it furnishes material that, with but little intensive training, could be made most helpful to the physician and the surgeon. He could cover more ground more thoroughly, more deliberately, and more creditably to himself, to the service, to his country and to all of humanity.

"The skilled pharmacist of today has had collegiate training and years of practical experience, with a manipulative skill in the handling of materials that eminently fits him for minor medical and surgical work. At the present time the pharmacist is taught a series of

subjects which qualifies him to supplement the work of the surgeon on closely co-related lines, especially in chemistry, bacteriology, clinical laboratory investigation, roentgenography, in assaying drugs, foods and other supplies, in analyzing human excretions, blood, sputum, etc., in testing drinking water, food products, soils, as well as in toxicology and drug compounding and dispensing.

"In any event, the services he could render are numerous, among them note taking, examinations, diagnoses of minor ailments, prompt clinical laboratory findings, and opinions would be invaluable. He could act as expert anæsthetist, as assistant in many operative directions, and could apply the less complicated dressings and plaster casts, and variously hold up the hands of the surgeon. He could apply much of the detail of medical advice in hygiene and dietetics. The whole subject of sanitation falls naturally within his purview, the precautions of hygiene, of preventive medicine generally, also applied bacteriology, disinfection and other prophylactic necessities of modern warfare.

"Justice to the medical men of the army and navy demands that they be given adequate assistance in the prosecution of their work, and the suggestion that skilled pharmacists be given a commissioned rank in the army and navy, and that they be made, also, medical and surgical assistants, will meet, we believe, not only with the unqualified approval of the medical profession generally, but with that of the public whose interests are still further protected."

PREPARATION OF DICHLORAMIN T.—Chlorinated lime of pharmacopœial strength—from 350 to 400 grams—is well agitated with two liters of water for half an hour. When sedimentation has taken place the supernatant fluid is siphoned off and the remainder filtered. Powdered toluene-parasulphonamid, 75 grams—the crude product may be used—is dissolved in the chlorine solution. If necessary the resulting solution is then filtered, placed in a separating funnel, and made acid by gradually adding 100 mls of acetic acid. 100 mls of chloroform is then added to extract the dichloramin. After frequent vigorous agitation the chloroform layer is drawn off, dried over calcium chloride, filtered, and allowed to evaporate in the air. The residue then obtained is powdered and dried in vacuo. If necessary it may be purified by recrystallization. Generally it is not necessary.

This chemical is stated to be powerfully germicidal and is generally used dissolved in a mixture of Eucalyptol U. S. P., which

has been chlorinated, and Liquid Petrolatum also chlorinated, equal parts of each. The amount of Dichloramin T dissolved in this mixture varies from 5 to 10 per cent., which is from twenty to forty times the strength of the Carrel-Dakin Solution, for which the Dichloramin T mixture is claimed to be a far superior substitute (*Jour. A. M. A.*, July 7, 1917, p. 27).

THE PROTEINS OF THE PEANUT (*Arachis hypogaea*).—The increasing popularity and consequent increased production of the peanut makes a study of its proteins especially appropriate at this time, a time of ever increasing demand for food-stuffs. Heretofore the proteins of the peanut have received scant attention. This investigation, undertaken in the Protein Investigation Laboratory, Bureau of Chemistry, Washington, D. C., discloses that this popular nut contains two globulins, *arachin* and *conarachin*, as well as small amount of albumin. Oil-free peanut meal was used in the investigation, obtained by expresion of raw Virginia peanuts with the aid of an Anderson expeller. The pressed cake was finely powdered and remaining oil removed by percolation with petroleum ether. Nitrogen estimation showed 18 per cent. equivalent to 45 per cent. protein. Extraction of the meal with 10 per cent. solution sodium chloride, 32 per cent. protein, is dissolved at room temperature, 78 per cent. of which was obtained in pure form by dilution of salt extract with 5 or 6 volumes of distilled water, or by saturation with CO_2 . It was also possible to obtain these globulins by dialysis of the salt solution. The two globulins were isolated by means of fractional precipitation of the protein extracted by salt solution. *Arachin*, which predominates among the globulins in the peanut, is the least soluble, and is precipitated when in a 10 per cent. solution of sodium chloride by the addition of ammonium sulphate to 0.2 of saturation. After separation of the *arachin* by filtration, *conarachin* is obtained by dialysis, or by saturation of the filtrate with ammonium sulphate. These two globulins show quite a difference in the sulphur content; it being 0.40 and 1.09 per cent. respectively. The distribution of nitrogen, particularly in the precentage of basic nitrogen, presents likewise a large difference, the figures being respectively 4.96 and 6.55 per cent. The basic nitrogen in a mixture of these globulins is likewise very high, namely, 5.23 per cent. It is just possible that *conarachin* contains more basic nitrogen than any other seed globulin so far investigated. Judging from the results so far obtained it seems safe to predict that peanut press cake will be found very useful

in supplementing food products made from cereals and other seeds whose proteins are deficient in the basic amino-acids (*Jour. Bio. Chem.*, vol 28, 77, through *Jour. Franklin Institute*. July, 1917, p. 120).

FORMALDEHYDE FOR SEED GRAIN.—Dilute solutions of formaldehyde gas are said to be very effective in preventing parasitic diseases of seed grain and therefore increasing the crop. 250 mls of the 40 per cent. solution, known as formalin, diluted to make 160 liters, is used to moisten 50 bushels of oats or other grain. It is left in a heap for 3 hours and then spread out to dry. Pharmacists in rural districts would do well to call this matter to the attention of their farmer customers (*Bull. Pharmacy*, 31, 1917, J. E. Taylor).

DULCIN AS A FOOD SWEETENER IN GERMANY.—Because of the scarcity of sugar in Germany the laws forbidding the employment of artificial sweetening substances have been repealed. And in lieu of our old friend "saccharin" they are using a new synthetic to which has been given the names "dulcin" and "sucrol." Chemically it is known as parphenetolcarbamide. Statements are made that this substance is absolutely harmless to man and animals; it is also claimed that it has the advantage over saccharin in that it has no bitter after taste, and that it does not mask natural flavors. It has been found that its sweetening strength is two hundred times that of sugar (*Chem. Zeitung: Chem. Abstr.*, 1917, 11, 999).

MERCUROPHEN.—This chemical is stated to be powerfully germicidal and of great use as a local antiseptic. Chemically, it is said to be sodium oxymercuryorthonitrophenolate. The mercurial content is said to be 53 per cent. This compound occurs in the form of a brick-red powder, free from odor and very soluble in water; very dilute solutions show amber-yellow. The powder is easily made into compressed tablets which dissolve very readily. Against *Staphylococcus aureus* it has shown itself to be fifty times more active than mercuric chloride, killing the bacteria on prolonged exposure in bouillon in a dilution of 1-10,000,000. It claimed to have a lower toxicity than mercuric chloride (*Jour. Amer. Med. Assoc.*, May 19, 1917).

DIGITALIS AMBIGUA.—Investigation of the leaves of this plant, which grows in abundance in Austria, seems to show that the activity from a therapeutic standpoint is on a par with that of the normal leaves of *Digitalis purpurea*. If this is so, there is no reason why they should not take the place of the latter (*Chem. Zeitung*, vol. 41, p. 99).

RHUBARB LEAVES POISONOUS.—The sudden death of a person alleged to have eaten rhubarb leaves has been reported from Enfield, England. The symptoms were those usual in cases of oxalic acid poisoning. Because of the scarcity of vegetables abroad the newspapers have been advising their readers to eat stewed rhubarb leaves as a substitute for cabbage. It is reported that a similar instance of death from the same cause occurred in 1901. The leaves are not usually used as food but nearly everywhere the stalks are consumed in the form of sauce and in pies. The leaves and stalks contain citric, malic, and oxalic acids, mainly as the calcium, magnesium and potassium salts. As is well known, the oxalic acid is decidedly toxic. Poisoning from eating the stalks is very rare; in fact literature contains no such record. The stalks seemingly contain less of this toxic acid. And then the amount eaten at a single meal is very small. It would be well not to encourage leaf consumption (*Jour. A. M. A.*, June 30, 1917, p. 1954).

D-MANNOKETOHEPTOSE: A NEW SUGAR FROM THE AVOCADO.—The ripe fruit of *Persea gratissima* contains a ketose of seven carbon atoms which was isolated in the crystalline condition and found to be d-mannoketoheptose. Its formula was established by analysis of its bromphenyl hydrazone and phenyl osazone and by a comparison of the latter derivative with the osazone of mannoaldoheptose; also by the fact that it yielded the two epimeric mannoheptites on reduction with sodium amalgam. The melting-point of the new sugar registered 152° and its specific rotation $+29^{\circ}$. Treated with yeast no fermentation was manifested; it was not changed by bromine in aqueous solution. It is said that this is the first heptose to be found in nature (*Jour. Biological Chem.*, vol. 28, 2, 1917, through *Jour. Franklin Institute*, July, 1917, p. 120).

IMPURE PICRIC ACID AS A SOURCE OF ERROR IN CREATINE AND CREATININE ESTIMATIONS.—It is stated that some specimens of this acid, especially those bought in a wet condition, contain some impurity, and, owing to the more or less intense coloration they give when neutralized with NaOH, are quite unsuitable for use in the colorimetric estimation of creatinine. When 20 mls of saturated picric acid solution are treated with 1 ml of 19 per cent. NaOH, the color, after fifteen minutes, should be not more than about twice as deep as the color of the saturated picric acid solution (O. Folin and E. A. Doisy, *Jour. Bio. Chem.*, 1917, 28, 349, through *The Analyst*, April, 1917, p. 149).

KAFARIN, AN ALCOHOL-SOLUBLE PROTEIN FROM KAFIR (*Andropogon sorghum*).—Until the present time no work has been done and reported concerning the proteins of kafir. Seeds grown in Kansas were used in this experimental work, of the kind known as dwarf kafir. The ground seeds showed 11.7 per cent. of protein, 7.9 of this was obtained by extraction of the meal with boiling alcohol. By the use of alcohol ranging from 60 to 70 per cent. strength, there was separated 5.2 per cent. of pure protein, *kafirin*. Kafirin in many respects resembles zein from maize, with this difference, that zein is very soluble in 70 per cent. alcohol at all temperatures, kafirin requires a large amount of the same strength of alcohol to effect solution. Kafirin is more readily soluble in hot than in cold alcohol; very dilute solutions will jelly on cooling. To avoid this it was necessary to use large volumes of alcohol and to filter the extractions while hot. Kafirin is easily coagulated while an alcoholic solution of zein does not when heated. It also differs from zein in the percentage of amide and basic nitrogen being 3.46, 2.97 and 1.04 and 0.49 per cent. respectively. There is also a difference in the amounts of diamino acids yielded. Kafirin contains lysine and tryptophane, which are absent in zein, and very necessary for animal nutrition (*Jour. Bio. Chem.*, vol. 28, 59, through *Jour. Franklin Institute*, July, 1917, p. 122).

SOME PROTEINS FROM THE JACK BEAN (*Canavalia ensiformis*).—*Canavalin* and *concanavalin*, two globulins, and an albumin, have been obtained from this bean. The air-dried jack bean meal showed the amount of protein to be 23 per cent., and 15 per cent. of this is extracted from the meal by plain distilled water. Two per cent. solution of sodium chloride increases the amount of extraction to 18.5 per cent. 0.2 per cent. solution of KOH extracted almost all of the protein, or 22.3 per cent. A mixture of meal and three times its weight of 10 per cent. solution of sodium chloride, and then ground in mill to break up cells gave an extraction of 20.5 per cent. protein. Dialysis of salt extracts of the bean against distilled water gave 10 per cent. of pure dried globulin, based on weight of the meal used. This globulin is so very soluble in salt solutions that it cannot be precipitated by diluting these solutions with water. The globulin of the jack bean is not identical with phaseolin, which substance was isolated by Osborne from the kidney bean (*Phaseolus vulgaris*). Concanavalin, the globulin present in the jack bean in the smaller amount, and which is less soluble, was

precipitated from a one per cent. salt extract of the meal by adding ammonium sulphate to 0.6 of saturation. The precipitate was filtered off, redissolved in water, and dialyzed until free from sulphates. Canavalin was obtained by making the filtrate from the concaavalin completely saturated with ammonium sulphate. The principal difference between the two globulins is in their sulphur content; the one is 0.48 and the other 1.10 per cent. From the analyses of these two globulins it is evident that only a small amount of concaavalin can be present in the mixture of globulins obtained by dialysis, since the sulphur content of canavalin and the mixture of globulins are practically the same. Canavalin estimates 3.17 per cent. of basic nitrogen. The albumin, which contains 3.73 per cent. of basic nitrogen, resembles the legumelins which have been described by Osborne and his co-workers (Abstracted from the *Jour. Franklin Institute*, July, 1917, p. 119).

CHEMICAL AND PHYSIOLOGICAL DETECTION OF SEVERAL ALKALOIDS IN THE SAME SOLUTION.—The well-known play of colors which occurs when strychnine is brought in contact with sulphuric acid and potassium dichromate is not realized when 1 milligram of strychnine nitrate and 0.04 gram or more of quinine bisulphate in the same solution are treated thus, a passing garnet-red color appearing, which changes to green or greenish-gray; with smaller quantities of quinine this reaction is distinct, but transient. The same result is noticeable when salts of the alkaloids with the same acid or just plain alkaloids are used. Crystals of strychnine picrate may be formed in the presence of a large excess of quinine, but they are not then characteristic. The alkaloids are easily and certainly separated by treatment with sodium potassium tartrate; quinine tartrate being insoluble in solutions of alkali sulphates and tartrates, whereas the strychnine salt is soluble. It is observed that mixtures which do not give the characteristic reaction with potassium dichromate do not produce the characteristic symptoms in the frog (*The Analyst*, May, 1917, p. 177).

ANOTHER NEW SOURCE OF POTASH.—The U. S. Geological Survey reports the separation of potash from wyomingite, a lava found extensively in the Leucite Hills of Wyoming. This mineral is a silicate of alumina and potash, containing much more potash than feldspar. By heating to a dull-red heat with calcium chloride 73 per cent. of potash is readily obtainable.

THE VOLATILE REDUCING SUBSTANCE IN CIDER VINEGAR.—EX-

perimental work in the preparation and purification of the phenylosazone obtained from the distillate from cider vinegar shows that such distillates contain a reducing substance that reduces Fehling's solution at room temperature. Judging from the melting-point of the phenylosazone obtained in these experiments and the amount of nitrogen it contained the indications point to its being diacetyl phenylosazone. Diacetyl and acetylmethylcarbinol, two substances from which this osazone could be formed, were made, and the actions of dilute solutions of these two substances were compared with those of the cider vinegar distillate. It was deduced that the reducing substance in the cider vinegar distillate is largely, if not altogether, acetylmethylcarbinol. It is stated that this substance is not formed during the distillation of vinegar but is present as such in the vinegar and certainly appears to be a normal constituent of cider vinegar (abstracted from *Jour. Franklin Institute*, July, 1917, p. 119).

CHRYSAROBIN.—Purified chrysarobin, or Goa powder, consists of the anthranols chrysophanol, $C_{15}H_{12}O_3$, and emodinol, $C_{15}H_2O_4$, and their methyl ethers. Emodinol methyl ether forms yellow needles melting at 180° ; chrysophanol methyl ether is not present in the chrysarobin now in commerce, which is said to contain about 33 per cent. of chrysophanol. The therapeutic action of the drug is due to the anthranols only; it is claimed that the substances insoluble in benzene take no part in it (*O. Hesse, Liebig's Ann. d. Chem., through The Pharm. Jour.*, Apr. 28, 1917, p. 353).

TEST FOR CHLOROFORM.—To 10 mls of chloroform add as much benzidine as will lie on the point of a knife and shake gently, when a clear solution will form. If the specimen is pure, the solution will remain unchanged 24 hours if kept in the dark. If 0.01 per cent. of phosgene is present, it becomes cloudy at once; if 0.1 per cent. is present a yellowish-white precipitate is formed. When chlorine is present, the solution becomes pale rose in color, changing afterwards to a blue; if HCl is present, the solution becomes cloudy immediately (*Utz, Pharm. Zentralb., Apotheker Zeitung*, 32-60, through *The Pharm. Jour.*, Apr. 28, 1917, p. 353).

CULTIVATION OF MEDICINAL PLANTS IN GERMANY.—According to an article in the *Pharm. Zeitung*, volume 32, page 166, the governments of Prussia and Saxony are urging and encouraging the cultivation of plants for medical use. A commission has been appointed to give the matter careful study and to report on the

possibilities in this direction. Attention is called to the fact that improvements in agriculture are leading to the cultivation of land upon which wild drug plants were growing and to keep up this supply it is absolutely necessary to cultivate them. The medical profession for a long time was prejudiced against the use of cultivated medicinal plants as it was felt that the activity and potency of cultivated drug plants was very inferior to that of the wild plants. But chemical and biological assay have shown that such prejudice has no basis in fact and is rapidly becoming a thing of the past. Where such inferiority may exist or appear it is undoubtedly due to improper and unsuitable methods of cultivation. Careful observation and experimentation will bring about the best conditions for cultivation, when without doubt the active constituents will show an increase. It is also worth while that in the cultivation of these plants they can be collected at any given period of their development and also that they can be gathered free from admixture (*The Pharm. Jour.*, May 5, 1917, p. 375).

BOOK REVIEWS.

YEAR BOOK OF THE AMERICAN PHARMACEUTICAL ASSOCIATION
1915. Chicago, Ills: Published by the American Pharmaceutical
Association 1917.

With the exception of the inclusion of the Constitution, By-laws, roll of Members, this volume is devoted to the report on the Progress in Pharmacy. The latter is the work of Professor Arny, Dr. Koch and a corps of collaborators. The work has been very well done, the abstracts being very succinct and yet containing the essentials of the articles relating to pharmacy and pharmaceutical products and preparations. It is difficult to conceive how any of the members of the Association could consider for an instant the possibility of doing away with this valuable publication. If it is true that is chiefly used by teachers and those engaged in research work this only proves the value of the Progress of Pharmacy that every one engaged in the practice of pharmacy should utilize it. It contains everything pertaining to the improvements in the preparation of medicaments and a great deal more. If the American Pharmaceutical Association stands for anything, its members should will-

ingly support this publication as it represents an ideal and shows that the Association means to develop the progress in pharmacy, and that its members have lofty sentiments and high ideals.

HENRY KRAEMER.

PHILADELPHIA COLLEGE OF PHARMACY.

ABSTRACTS FROM THE MINUTES OF THE MEETING OF THE BOARD OF TRUSTEES.

March 6th, 1917. Twelve members were present. The Committee on Instruction reported that Mr. C. J. Zufall had tendered his resignation as Instructor in the Department of Botany and Pharmacognosy, which was accepted. Committee on Examinations presented a communication from Prof. Roddy giving the names of the following students who had completed a Special Course in Bacteriology, and were, therefore, entitled to the Certificate: C. L. Coble, Wallace Dickhart, John F. Day, David Flores, George R. Gross, Edward F. Henning, Antonio Mena Hernandez, William Menkemeller, Jr., H. K. Mulford, Jr., Charles Norton, G. W. Neiffer, L. D. Rutter, Benjamin A. Sorber, Russell C. Smith, Albert Stoppel. The Board authorized certificates issued to the above. *The Special Committee on Diplomas* submitted a report proposing some changes in the form and wording of the diplomas. These changes were made necessary by the existing conditions. After the adoption of some of the proposed changes, it was ordered that a sketch be prepared and submitted at the next meeting of the Board. Karl F. Ehman, Class of 1916, was elected an Associate Member.

April 3d, 1917. Fifteen members were present. A communication from the Secretary of the College was read, announcing the election of officers for the ensuing year and three members of the Board of Trustees for three years. This being the first meeting of the new Board, George M. Beringer was elected Chairman; Walter A. Rumsey, Vice-Chairman and Jacob S. Beetem, Registrar. The Committee on Finance recommended that owing to the increased duties of Professor Stroup, the Editorship of the Bulletin be placed in the hands of Professor Sturmer.

Committee on Announcement read a report giving the approximate cost of publishing the six issues of the Bulletin, and recommending that hereafter the Bulletin be issued quarterly, namely, in

April, July, October and January. This would reduce the cost about 33 per cent. The Committee advocated an early issuance of the Catalogue Number and recommended that a definite and clear-cut policy regarding post-graduate instruction be outlined in same. The Committee referred to our Alumni and stated that the members of same should be kept well informed as to the post-graduate courses and other matters pertaining to the College, in order that they use their influence in assisting young men to matriculate in the College.

The recently established Advisory Council of the Alumni Association, embracing about one hundred of the more active members residing in every State of the Union and in twenty foreign countries, are earnestly working to further the interest of the College.

The Committee on Instruction also recommended that authority be given members of the Faculty to give a few lectures in the high schools of Pennsylvania in accordance with the suggestion of Prof. Sturmer. On motion, the recommendations were adopted.

The Special Committee on Diplomas, through Mr. Cliffe, presented the sketch for the new Ph.G. diploma and after some discussion the form submitted was adopted.

Mr. French read a communication from Colonel Allen, First Regiment, N. G., U. S. A., relative to four of our graduates students, who are now absent from the college, serving in the Medical Corps. Mr. Osterlund said he was particularly interested and hoped something could be done towards graduating the young men who were called to serve their country. The matter was referred to the Committee on Examinations.

The communication from the Secretary of the College was read, conveying the resolution adopted by the College at the annual meeting, recommending to the Board of Trustees that they extend the services of the College to the Government. Mr. Cliffe moved that the matter be referred to a Special Committee consisting of the President, Chairman of the Board and the Dean. It was so ordered.

A communication was received from L. L. Walton, Secretary, Pennsylvania State Pharmaceutical Board, announcing that the Board would require prospective pharmacy applicants who began their College course after July 1st, 1918, to present evidence of secondary education to the value of thirty counts. Mr. Cliffe moved that the Secretary be instructed to acknowledge receipt of the communication and state that the Philadelphia College of Pharmacy had already adopted the two year High School requirement, or

thirty academic counts, and same is to go into effect at the beginning of session 1918-19.

The Dean presented a thesis submitted by a member of class 1909 for the degree of Master in Pharmacy (in course) which, in accordance with the By-laws, was referred to the Committee on Examinations.

Communications were read from Professor William B. Day, Professor Fred. J. Wulling, and Mr. John K. Thum, expressing their appreciation of the honor conferred upon them by the College in awarding them the Honorary Degree of Master in Pharmacy.

The Dean announced the death of Professor C. Lewis Diehl and spoke of his work in the cause of Pharmacy and his loyalty to his Alma Mater and his adopted country. The Chairman referred to Mr. Diehl as the highest type of an American Pharmacist. Mr. England read a brief sketch of Mr. Diehl's activities in connection with pharmacy and moved that a Committee of three be appointed to draft resolutions upon his death and the Chairman appointed Messrs. Joseph W. England, Joseph P. Remington and E. M. Boring.

May 1st, 1917. Eleven members were present. The Committee on Instruction reported that a number of matters had been discussed at several recent meetings and the Committee had under consideration some very important matters and asked that an adjourned meeting of the Board be held to receive a report of the Committee.

The Committee referred to Dr. Roddy's absence at Fort Slocum, N. Y., and decided to have Mr. Gershenfeld complete the two lessons remaining in the Bacteriology course. The Treasurer, representing the Board, was appointed to take the diplomas to Dr. Roddy for his signature.

Mr. Cliffe moved that owing to the uncertainty existing, Dr. Roddy be granted a leave of absence for the balance of the session. It was so ordered.

The Committee on Examinations presented the name of Gilbert L. Harvey as having successfully passed the examination in the Food and Drug Course, and therefore was entitled to receive the Certificate of Proficiency in Chemistry. On motion, the Certificate was awarded. The Committee also presented the following names as those who had satisfactorily completed the Special Course in Bacteriology and were entitled to receive a Certificate: Pedro R. Carbo, William C. Forbes, James S. Horton, Acisclo Marxuach, Hermogenes C. Ramirez, Jose S. Reynes, Morton D. Stickle and

Donald B. Smith. On motion it was ordered that the Certificate in Bacteriology be awarded. The Committee reported as follows, relative to the status of students in the graduating class who had enlisted:

First, that all students who have been compelled to leave College on account of membership in the National Guard, previous to January 1st, 1917, be given a special examination in a manner that may be found by the Committee on Examinations to be best suited to the necessities of the situation, and that they be given due credit for any professional work performed during their service under the government.

Second, that all students who have enlisted or may enlist in the naval or military service of the United States, subsequent to January 1st, 1917, be given the same status upon their return as when they left College to enter service, except that due credit and advancement be given for any experience or instruction they may have obtained as pharmacists while in the government service. It was so ordered.

The Chairman advocated the adoption of a resolution asking the government to recognize pharmacists as professional men and not subject them to conscription in the ranks, as privates. Mr. England read a copy of a communication he had addressed to the Secretary of War, relative to establishing a Pharmaceutical Corps in the Army. The Chairman read a communication from Surgeon General Braisted, supplementing in a measure what Mr. England advocated. Mr. England then moved that the President of the College and the Chairman of the Board be authorized to forward such resolutions to the Federal Authorities. It was so ordered.

The Special Committee to prepare resolutions on the death of Prof. C. Lewis Diehl presented their report and on motion it was ordered that the resolutions be entered in the minutes and a copy sent to the family.

Mr. French proposed that some action be taken on the death of our Honorary Member, Frederick Gutekunst, and moved that a Committee of three be appointed to draft suitable resolutions. The Chairman subsequently appointed Howard B. French, A. W. Miller and C. A. Weidemann, as members of the Committee.

Mr. Cliffe, for the Committee on Examinations, stated it would be necessary to have a form of Certificate for students of the two year course who had not met the full requirements of the College

for a diploma and moved that the matter be referred to the Special Committee on Diplomas. It was so ordered.

May 15th, 1917. Fourteen members were present. The Committee on Instruction presented a lengthy report, giving a review of some of the conditions growing out of the changes in the courses of instruction. It also contained the annual reports of the Faculty, together with a number of suggested recommendations. The report was carefully considered and on motion the various recommendations were taken up seriatim.

1st. That the special rules on conduct and order, adopted by the Trustees relating to students, be printed in abstract and distributed to each student at the beginning of each term; and further, that the Dean address the students on the necessity of obeying the rules set forth.

2d. That two hours per week be assigned to Commercial Pharmacy.

3d. Prof. LaWall's recommendation to establish a student's conference of at least one hour per month for each class, as a part of the College curriculum.

4th. That Martin H. Gold be selected as the instructor in Botany and Pharmacognosy for the session of 1917-18.

5th. That hereafter the physical examination be made compulsory. Adopted. In this connection the Committee has appointed Doctors Lowe, Roddy and Heineberg to determine upon a feasible plan by which the medical examination can be systematically carried out.

6th. That Prof. Stroup be empowered to select an assistant to fill the vacancy caused by the resignation of Dr. Brewer.

7th. That Physics as a distinct branch be eliminated from the College curriculum.

8th. That the lecture work in Chemistry be divided into two parts, namely, General Chemistry and Pharmaceutical Chemistry. That Prof. Stroup retain General Chemistry and Prof. Sturmer be assigned Pharmaceutical Chemistry, and be given the title of Professor in Pharmaceutical Chemistry.

9th. That specimens as a separate branch of examination be eliminated and that hereafter the ratings in specimens in each department be included along with the rating in written work.

10th. That hereafter at least two of the scholarships be offered as awards to students in the second year class who have attained a high rating in the work of the first year.

11th. If the size of the second year class next year shall require three sections, that these be given the same lesson on alternate days of the same week. If not too large, however, it should be divided into two sections, working on alternate days.

12th. That a special course in Chemistry for Bacteriological students deficient in Chemistry be outlined for the catalogue.

13th. Professor Moerk's request that an additional assistant be allowed to help in the advanced instruction was also approved.

14th. Dr. Vanderkleed's request that "Chemical Control" as applied to Industrial Pharmacy be accepted as a more appropriate title than "Industrial Pharmacy" for the subjects covered by his lectures.

15th. That the teaching of scientific and technical German, applicable to the Post-graduate courses, be assigned to Professor Sturmer.

16th. Dr. Roddy having requested an assistant, but owing to Dr. Roddy's absence in the Medical Corps, and the uncertainties as to the effect of the war, action on this request of Dr. Roddy should be postponed. But if the necessity for an assistant arises, the Committee on Instruction should be authorized to select such an assistant.

Nominations being in order, Mr. Beringer nominated Prof. Freeman P. Stroup as Professor of General Chemistry and Professor Julius W. Sturmer as Professor of Pharmaceutical Chemistry. According to the By-laws these nominations lay over for one month for action.

Further recommendations by the Committee on Instruction were then considered, as follows:

1. It was recommended that in order to carry out existing agreements, the Phar.D. course should be continued, as advertised, for the next two years.

2. That the College continue the Ph.C. course as now provided by the By-laws.

3. That there be offered a Post-graduate course of one year, scheduled for three days per week, and a minimum of 700 hours of instruction. Any student who has successfully completed the two year Pharmacy course is eligible to this course.

The above recommendations were all approved.

In regard to the question of fees, which was considered by the Committee, it was on motion decided to advance the Laboratory fee to Fifteen Dollars, per annum. The fees for tuition were also

considered, but owing to the lateness of the hour, further consideration was postponed.

May 18th, 1917. Nine members were present, and regrets from eight members were noted. The Committee on Instruction read a supplementary report regarding fees, and after a very thorough discussion of the subject of fees and the methods of collection, the recommendation of the Committee was adopted.

The rules and regulations governing fees and general requirements for promotions and graduations would be published in full in the forthcoming announcement. On motion of Mr. Boring, a vote of thanks was extended to the Committee on Instruction for their valuable report.

The Committee on Examinations presented the name of Clarence H. Henderson as being entitled to the Certificate of Bacteriology. On motion the Certificate was granted.

May 25th, 1917. Eleven members were present. On motion of Mr. Cliffe, Professor J. W. Sturmer was invited to be present at the meeting of the Board.

The Committee on Examinations recommended Charles Elbert Hoffman, P.D. 1909, for the degree of Master in Pharmacy, Ph.M. (in course), for his thesis entitled "Topical Applications—the methods of preparation and means of dispensing for the treatment of diseases of the eye." see this JOURNAL, July, 1917. It was suggested that the degree be granted at the next Commencement. A ballot was then taken and being clear, the Chair declared Mr. Hoffman elected to receive the degree of Master in Pharmacy (in course).

The Committee on Examinations also presented the name of those who had satisfactorily passed the examinations and met all the requirements for graduation and were entitled to receive the diploma and certificates of the College. The number comprised 94 for the degree of Doctor in Pharmacy; 15 for the degree of Pharmaceutical Chemist (P.C.), old style, and 8 former students of the Medico-Chi who had completed their instruction at the Philadelphia College of Pharmacy, and were entitled to receive the degree of Pharmaceutical Chemist (Ph.C.).

A separate ballot was taken for each class and it being clear, they were elected to receive the degree.

The consideration of those entitled to receive the degree of Graduate in Pharmacy (Ph.G.) was postponed for the present.

Mr. Cliffe, for the Committee on Examinations, stated that the Rev. J. J. Joyce Moore had created a prize in memory of his father, J. B. Moore. The prize consists of a Troemner Agate Prescription Balance to be awarded to a member of the third year graduating class presenting the best thesis representing original work in the Department of Pharmacy. The Secretary was instructed to extend to the Rev. Dr. Moore the appreciation and thanks of the Board.

Mr. Cliffe then presented the report of prizes to be given to the graduates of the P.D. course. He also presented the name of Charles L. Coble as having taken the full course in Analytical Chemistry and entitled to receive the Certificate of Proficiency in Chemistry, and the name of Harry Philip Ottinger as having taken the Food and Drug Course and entitled to receive the Certificate of Proficiency in Food and Drug Analysis.

May 28th, 1917. Ten members were present. The Committee on Examinations presented the names of 93 candidates for the degree of Graduate in Pharmacy (Ph.G.), who had met all the requirements for graduation.

The Committee then presented the names of 38 students who had passed all the second year examinations and were, therefore, eligible to the degree of Ph.G. when the other graduation requirements shall have been met. They will receive a Certificate attesting to these facts.

Mr. Cliffe read a communication from Professor Kraemer, stating that owing to the merits of the theses of the Second year class he desired to present in addition to his prize to the Third year class a compound microscope for the best thesis in pharmacognosy in the Second year class. This was adopted. He then presented a report covering the award of prizes to students of the Ph.G. class, with the names of those who were to award the prizes. Mr. Cliffe also presented the form of Certificate to be given to those who had not complied with all the requirements.

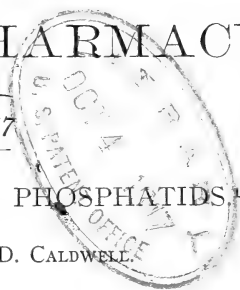
In addition to the names presented by the Committee for diplomas, there were presented the names of those entitled to Certificates and whose names would appear on the Commencement program. Two to receive the Certificate of Proficiency in Chemistry. Two to receive the Certificate of Proficiency in the Food and Drug Course. Twenty-five to receive the Certificate in Bacteriology, one to receive the degree of Bachelor in Science, in Pharmacy and Chemistry.

THE AMERICAN JOURNAL OF PHARMACY

OCTOBER, 1917

SPECIFICITY OF DRUGS FOR PHOSPHATIDS.

BY C. G. MACARTHUR AND G. D. CALDWELL.



The phosphatids are blamed for a great many physiological changes. Very often they are ascribed these special functions because certain other tissue constituents have been shown not to be involved, more often, however, because of their resemblances to ordinary fats. If one notes the complex and peculiar composition of the phosphatids it will be evident that it is not safe to rely too much on the physical resemblances to fats in an explanation of the physiological part the phosphatids play in the selective activities of the tissue cells.

In this investigation an attempt was made to see if there was any evidence that brain lecithin was involved in the specific action of brain drugs, and that heart drugs were not thus related to brain lecithin but were to heart lecithin. There is some evidence now that the two lecithins as prepared for this investigation are at least very similar in chemical constitution.² If the two are identical the drug specificity could not be attributed to their presence, but might be to a difference in amount or to a peculiarity in their position.

It is necessary to keep in mind the fact that there is not a very large amount of specificity in the drugs used for either of the tissues studied. In general there is only a difference in the degree of effect produced by a drug on the various tissues of the body. Then, too, it does not necessarily follow that because there is a certain pre-

¹ The importance of the work here reported was urged by the late Waldemar Koch. He was largely instrumental in getting the investigation properly started. C. G. M.

² J. E. Darrah and C. G. MacArthur, *Jour. Am. Chem. Soc.*, 38, 922, 1916. C. G. MacArthur, F. G. Norbury and W. G. Karr, *Jour. Am. Chem. Soc.*, 39, 768, 1917.

dominant physiological effect this is the result of a correspondingly large chemical alteration. A small amount of a drug in one tissue may produce a much more noticeable pharmacological effect than a large quantity in another group of cells. Data is continually accumulating which shows that some chemical compounds, as, for instance, the hypnotics and anesthetics, are selected by the various tissues in approximate accordance with their lipin content.

The phosphatids of the brain may be concerned in the action of brain drugs in one or more of several ways: (1) There may be a more or less firm physical or chemical combination between the drug and the phosphatid in the cell itself. This might interfere with the normal respiration, as there is evidence for believing in the case of anesthetics. The phosphatids are very likely concerned in the metabolism of cell food, so the drug might affect this process. (2) The drug may enter into combination of some sort with the extremely complex associations of lipoids, proteins, salts, etc., that very probably exist in the cell. In this case the effects produced might be similar to those given above, but there might be no direct effect of drugs on the lipins themselves. (3) Whatever the nature of the limiting surface layer of the cell, the phosphatids in it, through solution of the drug, adsorption of it, or chemical combination with it, may bring about a specific transference of this particular drug to the interior of the cell and there cause disturbance in normal activity by affecting compounds probably other than phosphatids. If it is a question of solution-permeability, then one would expect that the specificity would depend very largely on the localization and quantity of the lipin and not so much on its chemical nature. (4) Or the phosphatids may interfere with the passage in and out through this surface layer of food or metabolized products. This might lead to a more or less general cell asphyxiation or cell starvation in the former case, while in the latter we would have so-called toxic effects, resulting from accumulations of end products which would cause retardation (depression) or increase (stimulation) of the rate of metabolism.

The same possibilities apply to the action of heart drugs on heart phosphatids.

It is rather difficult to understand just how a drug could produce changes in physico-chemical properties³ without altering to some extent the chemical nature of the substances present. It

³ Handowskay, *Biochem. Z.*, 25, 510, 1910.

would seem that those who have been finding a difference, say of surface tension, as the prime cause of the changes produced by drugs are getting only another measurement of what others measure by changes in the state of aggregation or amount of chemical compound or adsorption compound formed. Undoubtedly it would not be true to speak of any one of these changes as the cause or even as the predecessor of another, for probably they occur simultaneously.

If digitalis, strophanthin and other heart drugs show their specificity in action on the heart by some particular effect on heart lecithin or heart cuorin, they ought to produce consistent changes in the very sensitive calcium chloride precipitation limit of the phosphatid solutions, while caffein, cocaine, strychnine and other brain drugs should have either no effect on the heart phosphatid solutions or a different one from the heart drugs. Brain drugs, on the other hand, should produce similar consistent effects on brain phosphatids.

EXPERIMENTAL.

Varying amounts of a standard CaCl_2 solution ($M/100$, $M/50$ or $M/25$) are added to two series of test tubes. To each tube is added water enough to bring the amount to 5 Cc. A .2 per cent. or .3 per cent. phosphatid solution is made by continuous shaking of the required amount of phosphatid in water till homogeneous. An aliquot part is used for control experiments, while the rest is shaken with the drug to be tested. Five Cc. of the control solution is added to each of the series of tubes containing calcium chloride, while 5 Cc. of the drug solution is added to the tubes of the other series. The difference in the molecular amounts of calcium chloride necessary to precipitate the drug solution from that required for the control is a measure of the influence of the drug on the phosphatid. Readings are taken after twenty-four hours.⁴

Relation to Oxidation.—With new lecithin solutions the method is accurate to .1 Cc. of $M/100$ calcium chloride. The phosphatid solution slowly changes, thus making it necessary to run controls every day. This change seems to be related to the stage of oxidation of the preparation. The darker and older the phosphatid, the greater the amount of calcium chloride required to precipitate the lipoid and as a rule the smaller the difference between the controls and the drug solutions. One sample of lecithin was originally pre-

⁴For more details of method, see W. Koch, *Jour. Pharm. and Exp. Ther.*, 2, 239, 1910.

cipitated in a .0048 molecular solution. A few days later the molecular concentration required was .0055. After a week it had risen to .0059 M. If the state of oxidation of the phosphatid is related to the nature or amount of combination between the phosphatid and the drug, one would expect that the presence of the drug would affect the rate of oxidation of the lipin.⁵ There seems to be but little doubt that one of the effects of those drugs which give evidence of combining with the phosphatids is to alter the auto-oxidation of the lipin.

Relation to Drugs.—In the following tables drugs in a dilution of 1/1000 were used instead of more concentrated solutions, because these small quantities seemed comparable with the amounts that might actually exist in a tissue when therapeutic amounts are given.

TABLE I.
Heart Lecithin A, 0.3 Per Cent.

	CaCl ₂ to ppt.	Control.	Diff. in CaCl ₂ .
1/1000 digitalis.....	.0110	.0044	+.0066
" strophanthin.....	.0057	.0044	+.0013
" veratrin.....	.0057	.0044	+.0013
" convallamarin.....	.0066	.0044	+.0022
" saponin.....	.0052	.0044	+.0008
" aconite.....	.0044	.0044	.0
" strychnine.....	.0044	.0044	.0
" caffeine.....	.0044	.0044	.0
" theobromine.....	.0044	.0044	.0
" chloral.....	.0044	.0044	.0
Ether 2 Cc. per 25 Cc. sol.....	.0044	.0044	.0
Chloroform 2 Cc. per 25 Cc. sol.....	.0040	.0044	-.0004

TABLE II.
Heart Lecithin B, 0.2 Per Cent.

	CaCl ₂ to ppt.	Control.	Diff. in CaCl ₂ .
1/1000 strophanthin.....	.0059	.0055	+.0004
" chloral hydrate.....	.0059	.0055	+.0004
" saponin.....	.0068	.0059	+.0009
" phlorhizin.....	.0068	.0059	+.0009
" nicotine.....	.0064	.0055	+.0009
" caffeine.....	.0048	.0048	.0
" urethane.....	.0055	.0055	.0
" strychnine.....	.0055	.0055	.0
" cocaine (HCl).....	.0055	.0055	.0
" morphine (SO ₄).....	.0064	.0055	+.0009
" atropine.....	.0066	.0048	+.0018

⁵ This question is being studied directly by adding drugs to phosphatid solutions and comparing the rate of oxidation with phosphatid controls.

TABLE III.
Brain Lecithin, 0.2 Per Cent.

	CaCl ₂ to ppt.	Control.	Diff. in CaCl ₂ .
1/1000 strophanthin.....	.0040	.0037	+ .0003
" chloral hydrate.....	.0042	.0037	+ .0005
" saponin.....	.0044	.0040	+ .0004
" nicotine.....	.0040	.0040	.0
" caffeine.....	.0040	.0040	.0
" urethane.....	.0037	.0037	.0
" strychnine.....	.0040	.0037	+ .0003
" cocaine (HCl).....	.0040	.0040	.0
" morphine (SO ₄).....	.0036	.0035	+ .0001
" atropine.....	.0050	.0040	+ .0010

It will be evident from Tables I and II that such heart drugs as digitalis and strophanthin, etc., do produce an effect on heart lecithin that brain drugs like caffeine do not. But in Table III it will be noted that heart drugs produce practically the same effects on brain lecithin. Therefore it seems reasonable to suppose that strophanthin and digitalis are active on phosphatids because of the chemical nature of the drugs. Very likely this action can be attributed to the fact that they are glucosides, because chemical substances such as phlorhizin and saponin, which are not heart drugs, produce very similar results with both brain and heart lecithins.

At first one might conclude that the lecithins are in no way related to drug action. But in the cases where an effect on the precipitation limits of CaCl₂ is produced by a drug it seems necessary to assume that the lipins have at least a secondary importance. The results would indicate that the combination between the drugs and the lecithin is not the chief cause of the specific action. It is possible that the effect is largely oxidation, as noted above. But another possible way of explaining the relationship is to suppose that the location and quantity of the phosphatid determine whether the particular drug will enter the tissue cell or determine the amount that will enter. In this case the final drug effect would be determined by the non-phosphatid constituents or the associated complexes of the interior of the cell. Strychnine does give evidence of direct specificity for which it is difficult to account.

Different Salts of Drugs.—The following table records the differences in the precipitation limits found in the various salts of strychnine.

TABLE IV.
Heart Lecithin C, 0.3 Per Cent.

	CaCl ₂ to ppt.	Control.	Diff. in CaCl ₂ .
1/1000 strychnine (alk.).....	.0097	.0097	.0
“ “ nitrate .....	.0114	.0097	+ .0017
“ “ sulfate .....	.0114	.0097	+ .0017
“ “ acetate .....	.0123	.0097	+ .0026

Other alkaloids gave similar differences also. Of course, these differences must be due to the direct action of the negative radicle on the lipin. This data shows the necessity of working with the alkaloids themselves if comparable results are to be obtained. It indicates, too, that small amounts of impurities affect rather largely the results obtained. Some of the variations found in different preparations might be attributed to this cause. It might be said that the results obtained were due to impure drugs. Though the compounds used were not purified, they were the best obtainable on the market. One would not expect the consistent data obtained if these impurities were related so definitely to the results. In the organism, however, the different salts would not produce changes similar to those recorded above because the drug, no matter in what form it was administered, would arrive at the cell in the same form.

Concentration of Drugs.—It was desirable to know what was the effect of differing drug concentrations upon the lipins.

TABLE V.
Heart Lecithin, 0.3 Per Cent.

	CaCl ₂ in ppt.	Control.	Diff. in CaCl ₂ .
1/1000 strophanthin .....	.0052	.0044	+ .0008
1/2000 “ .....	.0048	.0044	+ .0004
1/4000 “ .....	.0046	.0044	+ .0002
1/8000 “ .....	.0044	.0044	.0

With an increase in amount of drug the difference in amount of CaCl₂ necessary to precipitate the lecithin increased. This fact is consistent with the larger effects produced by increased amounts of drug and so would indicate that the lipins are concerned in the relation between drug concentration and amount of pharmacological effect produced.

Cuorin and Cephalin.—If brain lecithin and heart lecithin do

not account for direct specificity of drug action in the brain and heart, it might be that cephalin and cuorin would. Lecithin from the heart may be identical with brain lecithin but cuorin is not the same as cephalin.

Though they were repeatedly experimented with as above described for lecithin, they gave results which indicated that the drugs affected cuorin and cephalin much as they do the lecithins. There were no indications that specificity was due to them. However, because of the rather unsatisfactory end points the results with these two phosphatids are not very conclusive.

CONCLUSIONS.

1. Drugs do affect the auto-oxidation of lecithin. One of the ways in which some specificity may exist, then, is in the alteration in tissue oxidation.

2. Though certain compounds (principally the heart drugs) do combine with heart lecithin, there is no direct specificity, because they affect brain lecithin in the same way. This would indicate that the peculiar action of these drugs was due to an effect on the complexes in the cell itself, not on the phosphatid, but that the lipins in the surface layer of the tissue cells may determine the amounts of the drug that will enter.

3. The precipitation limits of calcium chloride on lecithin solutions are different when different salts of the drug are present. It is necessary, then, in a comparative study to use the free alkaloids.

4. The higher the drug concentration, the greater the amount of combination with the lecithin.

5. Heart cuorin and brain cephalin give no indication of being more related to specificity than the lecithin.

FROM THE BIOCHEMICAL LABORATORIES OF
THE UNIVERSITIES OF CHICAGO AND ILLINOIS.

THE WAR AND PHARMACY.¹

BY CURT P. WIMMER, A.M., PHAR.D.

On August 1, 1917, three years will have passed since the outbreak of what history, no doubt, will call the "world war." And, indeed, this term will be well-chosen, for the majority of the civilized nations of the world are now engaged in a life and death struggle, the likes of which the world has never seen before. War is the most serious business in which a nation can engage; a business in which tremendous sacrifices in life and property must be made and in which compensation for the investment is most uncertain, be the war aims ideals or provinces or indemnities.

Modern wars are not fought by armies alone but by the combined effort of the nation's entire population and resources. This again means that each and every business and profession must be profoundly affected in some way or other, and now that we have entered the great struggle and are, from all appearances, to play a leading and possibly deciding part, it is both timely and appropriate to devote a short time to a discussion of the influences which the war has had upon pharmacy up to the present time and is likely to have in the future.

And another question which we might well try to answer at the same time is: Is there not in this carnival of blood and devastation to be found a consoling element, a compensating factor, the proverbial silver lining of the cloud? Compared with the other nations at war we have felt, so far, little of the effect of war upon pharmacy. Should, however, the conflagration last for two or three more years, as some of our high officials say it will, we shall, no doubt, feel as much as European countries, at least as the group of Allies whom we have joined. Let us, therefore, make a brief survey of the condition of pharmacy in the European countries and deduce from that what may be in store for us.

Unquestionably, the difficulties of the pharmacists in the Central Powers are great and perplexing. A careful review of German and Austrian publications reveals the fact of the existence of considerable shortness of qualified assistants. Almost every other adver-

¹ Read at the annual meeting of the New Jersey Pharmaceutical Association, June, 1917.

tisement for help asks for lady pharmacists. It seems, then, that female help is being employed in German pharmacies on an unprecedented scale. In many stores the proprietor will manage to get along without any assistant whatsoever.

All chemicals of any use to the government have been seized. Pharmacists are permitted to have on hand certain fixed amounts only. This fact, together with the great difficulty of import, owing to the English blockade, explains the veritable flood of substitutes which we find recommended in the pharmaceutical press. We find substitutes for soaps, starch, rubber, honey, baking powder, coffee, cocoa, tea, pepper, oil, varnish, glycerin, eggs, jam, soups, butter, sugar, candies, glue and many others. Some of these substitutes, especially some of those offered under proprietary or trade names, have been found to be rank fakes. For example, a salad-oil substitute was upon analysis found to be a solution of gum in water, colored yellow with a coal-tar dye and having a food value of only 1/240 of that of oil.

Of particular interest to us are substitutes for necessary pharmaceuticals and I will mention a few of them.

In place of tincture of iodine, a 5 or 10 per cent. solution of tannic acid in 95 per cent. alcohol is recommended.

In order to save lard or edible fats, the following is recommended as a base for liniments and ointments:

Liquid Paraffin	460.00 Gm.
Olein	90.00 Gm.
Oil of Rape Seed	130.00 Gm.
Ammonia Water, duplex	150.00 Gm.
Lime Water	100.00 Gm.
Water	50.00 Gm.

Whoever has liquid vaseline on hand may use the following formula:

Liquid Vaseline	535.00 Gm.
Rape Seed Oil	100.00 Gm.
Olein	85.00 Gm.
Ammonia Water, duplex	135.00 Gm.
Lime Water	100.00 Gm.
Water	45.00 Gm.

Both preparations are claimed to be readily miscible with chloroform and could, therefore, be used as basis for chloroform liniment.

Another interesting preparation is the vegetable milk. Experiments with the milk-juice of the Soya bean, the walnut, hazel-nut and almond are claimed to have proven these milks fully as good as cow's milk. Indeed, they separate, upon standing, a cream which when used in tea, coffee or cocoa imparts the same taste as does cream of cow's milk.

Owing to the scarcity of soap, the following preparation is widely used: Quillaja bark, 100 Gm., is heated with 300 mls of water in a steam-bath for one half hour. Filter and when cool add kaolin 400 Gm. and talcum 400 Gm. Flavor with 10 gtt. of benzaldehyde.

The use of sodium perborate in washing powder is recommended.

Glycerin, of course, is no longer obtainable and a great many substitutes for it are offered. The most important of these are offered by Dr. P. E. Unna. According to him, glycerin substitutes must be differentiated as to the purpose for which the preparations are intended. They may be divided into four classes: (*a*) solution of salts; (*b*) solutions of sugar; (*c*) solutions of gums; (*d*) solutions of oils. A solution of iodine in glycerin to be used for painting ulcers and wounds is replaced by a solution of iodine in simple syrup. Glycerin as a softener for the skin is replaced by a mixture of equal parts of anhydrous eucerin and concentrated solution of calcium chloride. As laxative or enema, glycerin can be replaced (and it is claimed very effectively) by ordinary brown syrup mixed with two to four times its volume of milk.

To replace saltpeter in asthma remedies, they use sodium nitrate, potassium chlorate or sodium perborate. Liquid paraffin mixed with spermaceti replaces vaselin. *Rhamnus purshiana* is replaced by cortex frangulæ; oil of turpentine by benzol mixtures; tamarind by prune; starch in powders and pastes by talcum; tea by strawberry leaves; lycopodium by a colored starch, etc.

You can readily imagine what the troubles of the German or Austrian pharmacist must be! A constant search for "something just as good."

That the serious war-time has not yet killed the sense of humor of the Germans is evidenced by an answer to a proposal to declare two days a week as "medicine-less" days to save the supply of medicines. The answering correspondent of a pharmaceutical journal declares that it would be necessary in order to make medicine-less days effective to also declare "sickness-less" days. He also adds

that the impending shortness of cotton would no doubt require the institution of some "dress-less" days.

And now a few words about pharmacy in war times in some of the countries of the Allies. The war has brought to Russian pharmacists a realization of their dependence upon German products. This is shown by the formation of a number of new chemical and pharmaceutical societies created for the purpose of manufacturing pharmaceuticals formerly obtained from Germany. In this they have been quite successful and they are now manufacturing in Tomsk, for example, such preparations as xeroform, airol, anti-febrin, urotropine, etc. There is also a great movement on foot to cultivate medicinal plants, for example, the castor bean in Selgirka. Other parts of Russia claimed to be suitable for drug cultivation are Crimea, Turkestan and the Caucasus.

Of the belligerents which have been in the war for almost three years, the western group of the Allies, England and France, have been least affected, comparatively speaking. The importation of drugs into England especially has been well maintained. This explains the almost complete absence of formulæ for substitutes in the English and French publications. In the issues of the last two months there is, however, clear evidence that the war is pinching the English pharmacist. The Army Council of the English government has taken possession of all stocks on hand in a wholesale or retail business in excess of quinine sulfate, 100 oz., quinine bisulfate, 25 oz., quinine hydrochloride, 25 oz., phenacetin, 7 lbs., formaldehyde, 10 gallons.

Trading in seeds, oils and fats is being closely controlled and no dealing in these substances is allowed except upon permission of the Ministry of Munitions.

Glycerin is now no longer available for medicinal purposes and pharmacists are requesting physicians to prescribe glycerin substitutes. Glycerin also may no longer be used in the manufacture of soft gelatin capsules, except in a few specific cases, as apiol, creosote, guaiacol and a few others.

The use of rice, wheat or rye flour in toilet preparations is prohibited.

Another commodity, or better, necessity, which is now short is sugar. Physicians are requested to no longer prescribe syrups, and pharmacists are notifying their customers that preparations containing sugar will be no longer available. I cite you a letter of a

correspondent of the "Chemist and Druggist," March 10, 1917, as follows: "Must such preparations (referring to syrups) be ever thus presented? Would not a sour or bitter form suit just as well? There are more desirable flavours than sweet, though these are most pleasing to infants. But sour preparations would suit even better in many cases, and fermentation would be prevented. Would not a bitter suit the beer-drinker better? Would not an acid preparation suit the tart old maid or the still younger 'tart'? If sugar be wanting, and it is, it becomes more than your duty, your privilege, to lead the way in demonstrating the fact that sugar as an adjunct to drugs can and will be superseded by —. It might be announced thus: 'Owing to national scarcity of sugar, we beg to inform our clients that what were syrups in the sweet and piping times of peace have now become war sours and bitters! They have the same therapeutic medicinal value, the only difference being the exchange of a sour or bitter flavouring in place of the sugar or sweet.'"

The B. P. does not stand in the way of such necessary innovations. No syrups or sugar coating during the war, then none will be wanted after!

An interesting proposal is the use of malt extract in place of sugar. It was found after considerable experimentation that 1 gram of malt extract generally produces about 1 gram of sugar in a porridge or rice and milk pudding.

And now, in the light of war conditions abroad, what is likely to result here in the event of a prolonged war? In my opinion we will have to face the following:

1. The supply of assistants will be still shorter and less satisfactory than it is now. Many of our young pharmacists have already enlisted, more of them will be drafted. A considerable number of those not in the service will probably seek and find employment in other business ventures which are now more profitable than pharmacy.

2. The prices of certain chemicals and drugs will rise to higher levels than they are even now. Some chemicals, no doubt, will disappear almost entirely from the pharmaceutical market. Glycerin will probably be the first common substance to become scarce. Sugar, fats and oils will, no doubt, follow.

3. The volume of business done by the average pharmacist will probably increase, but the net income will not keep step with this

increase. In other words, it will be more expensive to do a certain amount of business than heretofore. Also let us remember the inevitable and heavy war taxes which will come along.

4. It is not at all impossible that a governing body will be created to control our business, say a "Ministry of Foods and Drugs," which will order what we may sell and what not, what prices we may charge, how much of a substance we may keep on hand, etc.

The picture of our immediate future is scarcely a pleasing one, but you know what Sherman said about war and the truth of this quotation will in the not very far distant future be brought to the realization of us all.

And yet, one can not fail to see the bright side of the picture. I find it in the tremendous impulse given by the war's necessities to pharmaceutical endeavor. The old proverb that necessity is the mother of invention is again proven true. While the large number of new remedies proposed are principally for army use, some will no doubt prove of great general value. Quite unexpected was the development of preparations of insecticidal value, especially for the louse. Lice have been found to be carriers of spotted fever and lice-killers are, therefore, of great importance. The Germans use a vinegar of savadilla, the French an ointment containing 10 per cent. of oil of stavesacre, the English have an N.T.C. mixture, composed of naphthalene 96 parts, creosote 2 parts, and iodoform 2 parts.

Numberless new methods and preparations for the cleansing and healing of wounds have been created by the war. I mention only the method proposed by Dr. Carrel of continuous irrigation with hypertonic saline solution, or of frequent dressings. A so-called "Bipp Paste" composed of

Bismuth Subnitrate	1.0
Iodoform	2.0
Liquid Paraffin	q.s.

is now claimed to give incomparably better results than the above method.

A new ointment tried out in the Royal Army Medical Corps has been found to be excellent for burns and cases of "trench-feet." Its composition is the following:

Resorcin	1 per cent.
(may be replaced by B-Naphthol $\frac{1}{4}$ per cent.)	
Oil of Eucalyptus	2 per cent.
Olive Oil	5 per cent.
Soft Paraffin	25 per cent.
Hard Paraffin	67 per cent.

Another preparation which no doubt will have permanent value is the Carrel-Dakin solution of the hypochlorites.

The intensive experiments in the cultivation of medicinal plants, the efforts of everyone to make himself independent of his neighbor, the efforts to avoid or utilize waste-products—all this must eventually rebound to the benefit of mankind.

There is no doubt in my mind that when our hour of trial comes, when medicines become scarce in amount and high in price, the inventive genius of the American pharmacist will assert itself and when the fray is over will proudly take its place among those who have contributed to the welfare of mankind.

RESEARCH IN PHARMACY COLLEGES¹

BY H. V. ARNY.

That the sum total of knowledge, which we delegates to the meetings of the American Conference of Pharmaceutical Faculties teach to our students, is the result of millions of experiments of thousands of experimenters is self-evident. No one of us who enjoys library work can but realize the enormous debt we owe to the research men of the past, be they patient plodders of little fame, or brilliant investigators whose names are almost household words. And how are we of the present generation of teachers paying this debt? Are we looking wise and doing nothing? Are we living up (or down, if you like) to the impertinent query on a modern postcard: "Do you ever spend anything besides the evening?" Or are we doing our bit; thus adding our trifle to the enormous mass of information inherited from our predecessors?

The study of the *Proceedings* of the American Pharmaceutical Association and of the pharmaceutical journals of the nineteenth

¹ Read before the American Conference of Pharmaceutical Faculties, August, 1917.

century makes the delver truly humble. Are we "doing our bit" as did Parrish and Proctor and Squibb and Rice and Maisch and Trimble, to say nothing of the many retail pharmacists of that day who suggested improvements of manipulation that they dug out of their routine practice? A truly interesting study would be an inquiry as to whether the decline of professional pharmacy is due to a decline in research work or whether the transition of pharmacy from an art to a mere bartering has stifled the research spirit, but that is not the object of the present paper.

What we of the Conference should discuss is the query: "Are we doing our bit?" A careful comparative study of current and past pharmaceutical literature leads me unwillingly to the conclusion that we of the colleges have not been doing our share of research; that too large a percentage of pharmaceutical research of the past decade has been done outside of our colleges. The pharmacopœial work of Beringer, the retail pharmacist, the research work of the score or more chemists in pharmaceutical houses, the fine investigation of anæsthetics by Baskerville; the remarkable adsorption work of Lloyd, the painstaking study of alkaloidal separation done by Beal and Lewis in the chemistry department of the University of Illinois are types of work that should have been done in the laboratories of our pharmacy schools, and we of the faculties are the poorer for not holding up our end of the line with sufficient work of similar character.

But it is not the purpose of this paper to find fault. The facts, distasteful though they may be to some of us, are stated merely to ask why these conditions should obtain. Every one of us here knows why. Few of us are in a position to frankly state the reason. In fact, until his appointment by President Lyman upon the Committee on Research of this Conference, the writer hesitated to speak positively on the subject. But as he has reached the arbitrary line of demarcation between impetuous youth and conservative age, he feels he has the right to speak, not for himself, but for the benefit of those who come after him. He is one of the group who, a quarter of a century since, fitted himself for teaching in an atmosphere of research. Actually entering upon a teaching career, he found the three hindrances to research usual to most of our schools of pharmacy: (a) a mass of routine work apart from the regular hours of instruction; (b) a meagre income that had to be augmented from outside sources; (c) abundant opportunity to secure such profitable

work. This condition confronts almost every energetic teacher in a college of pharmacy. The more willing he is, the more administrative work is placed upon his shoulders; the more alert he is, the more opportunity there is to materially increase his income by outside work; and between these two grindstones, the original desire to do research work becomes extremely attenuated.

Again, as the teacher grows older and better known, a fourth factor hindering research comes into being: the constant interruptions, telephonic, social, pedagogic or administrative, that are a part of a busy man's day. In fact, if an older man is to do research work, there are but two ways in which he can accomplish his desire; he has either to become an unsocial recluse, or he has to have a helper to do the actual work under his directions. The latter plan is not entirely unfeasible; in fact, in the busiest years that the writer has had, he did his most prolific research work, since he had the income to pay a competent assistant to give his entire time to the problems at hand. Subordinates on the teaching staff are usually slender reeds upon which to lean as far as research work is concerned, since as a rule, under our present college methods, instructors have their hands more than full if they conscientiously carry out their routine duties.

Can the situation be remedied? To solve this problem our new Committee on Research has been appointed, and the writer does not wish to arrogate to himself the functions of that committee. To promote discussion, however, the following thoughts are suggested:

First. That it should be expected of each teacher that each year he publish some article reporting original research. The research need not be necessarily complex. The improvement of a pharmacopoeial formula is sometimes of more practical value than the untangling of a complex chemical formula.

Second. If college authorities demand this research, it is obvious that they should encourage such work rather than hinder it by placing greater and greater responsibility on willing shoulders.

Third. Research fellowships, either in pure or applied science, should be established at each college of pharmacy and these fellows should perform their investigations under the directions of the regular members of the faculty, who thus will have the opportunity of displaying originality as demanded in the first requirement given above.

Fourth. A systematic campaign should be inaugurated among

the philanthropic public, educating it to the importance of pharmaceutical research. The remarkable gifts made to medical research during the past decade show what a systematic campaign can do and of all of the immensely valuable fields of medicine, none is more important to the common weal than is the field of pharmaceutical research.

PHARMACOLOGIC SUPERSTITIONS.¹

BY HORATIO C. WOOD, JR., M.D., PHILADELPHIA.

THE TEST OF UTILITY.

There are a number of worthless therapeutic practices—some based on abandoned theories of pathology, some due to technical errors in pharmacologic investigations, some based on misinterpreted clinical observations, and some the mere relics of medieval superstition—which still persist in common use. Some of these receive even today the sanction of authority; men whose acumen in many lines has won our respect occasionally lend the weight of their recommendation to measures which can be defended on neither theoretical grounds nor clinical results. It has seemed to me that it might be worth while to call attention to the source of some of the more common superstitions of this character.

First, however, it is necessary to establish the criteria on which we base our judgment as to the therapeutic value of a drug. Certainly the length of time during which a drug has been employed in medicine furnishes no measure of its usefulness. Ammoniac gum was described by Dioscorides in the first century, and for more than a thousand years was highly esteemed, but has fallen into such disuse that it is no longer recognized by the U. S. Pharmacopeia. In studying the materia medica of the first, tenth and fifteenth centuries, one is struck by their similarity to each other and their difference from that of today. Remedies whose reputation was sustained unabated for 2,000 years have been unable to bear the light of modern knowledge, and within half a century have not only been completely discarded as worthless but their very names forgotten.

The first edition of the U. S. Pharmacopeia was published less than a century ago.² Of 624 drugs and preparations deemed by the

¹ Reprinted from the *Journ. Amer. Med. Assoc.*, Vol. LXVI, pp. 1067-1073.

² Dec. 15, 1820.

editors of that work to be "those, the utility of which is most fully established," 305 have been already despoiled of their official recognition. I have been surprised in looking over this interesting work, not so much, however, by the number of ancient remedies which we have ceased to use, but by the absence of drugs today universally recognized as our most valuable weapons against disease. Neither iodine nor any of the iodids are in the first American Pharmacopeia; one looks in vain for potassium bromid or any other preparation of bromine; there is no form of salicylic acid except the oil of gaultheria, and that apparently was recognized only for its aromatic odor; one finds neither chloral nor any of our modern somnifacients; coca and cocaine are both missing, as are also scamoniac and scamonin; ether is recognized, but chloroform was unknown; nitroglycerin is not mentioned, the only form of nitrite recognized being sweet spirits of niter; the only mention of ergot is in the secondary list—that is, drugs of doubtful worth—where is listed *Secale cornutum* or spurred rye, but it was not deemed of sufficient importance to have any preparation recognized. One is not surprised at the absence of our modern coal tar derivatives, such as acetanilid and phenol (carbolic acid), but that the usefulness of aspidium or pilocarpus should not have been earlier discovered seems worthy of comment. In the place of these remedies which the present day physician relies on in such a host of conditions, we find horseradish, oatmeal, barley, stag's horn, metallic gold and silver, cowhage—whose sharp bristles were used as a vermifuge on the theory that they would stab the worm to death—and scores of remedies not even whose names would be known to many readers.

Are we to gage the utility of a therapeutic agent by the clinical results we think we see? Wendell Phillips said in one of his famous orations, "You read history not with your eyes but with your prejudices." The thought might well be applied to the medical profession. Practically all our experience is interpreted through the glasses of our prejudice. Never, since the days when the ancient Assyrian chanted his exorcisms of the pathogenic devil according to the phases of the moon, have men been able to free themselves in the choice of their remedies from the dominance of some theory concerning disease. Indeed, it cannot well be otherwise. The manifestations of disease are so protean, and its development subject to such an infinitude of variation, that no simple collection of observations without interpretation is of the slightest value. If those who believe

that empiricism should be the only guide in the treatment of the sick could read the history of medicine "with their eyes," they would see what a feeble flickering light to the progress of medical science experience has been; nay, it has been a veritable will-o'-the-wisp, leading men astray farther and farther from the truth. For fifteen centuries the experiences of medical Europe were interpreted to suit the theories of the great Galen, and in these fifteen hundred years, with their observations of millions of deaths, physicians learned absolutely nothing of how to relieve suffering or prolong life. A splendid illustration of the blindness of humanity to their surroundings is seen in the duration of the bloodletting superstition. For three centuries physicians with the best motives bled their patients to death, absolutely incapable of realizing that their venesection killed far more than it saved. Despite the frightful mortality of their methods of treatment, they clung to the error with the enthusiasm of a religious fanatic. Dr. Benjamin Rush on his death-bed, almost pulseless from the combined effects of disease and repeated venesections, begged the attending physicians to bleed him again. The story of the pneumonia "cures" is another interesting confirmation of the deceptiveness of experience. Time after time has some new method of treating this disease been brought forward with most impressive statistics which would seem to have established it as of the utmost value, and yet despite the venesection, veratrum, creosote, quinin, alcohol, camphor, ice jackets and poultices, the mortality of this disease is practically unaffected.

Of the drugs of generally recognized utility,³ numbering about 270, not one third of those introduced within the last hundred years were discovered through the medium of bedroom observations.

If neither antiquity nor clinical results can establish the therapeutic credentials, on what grounds are we to accept therapeutic claims? There are those who pretend to believe that the final judgment as to the therapeutic value of a drug can be made in the pharmacologic laboratory; such a claim, however, is so foolish as scarcely to be worthy of a refutation. Although it is undeniable that we owe most of our useful drugs to the researches of chemists or physiologists, their conclusions concerning the value of a remedy can be accepted only when confirmed by clinical experience. I do not know how many rabbits Ehrlich and his assistants cured with salvarsan, but I do know that he was unwilling to permit this drug

³ A Handbook of Useful Drugs, Chicago, 1913.

to be placed on the market until the conclusions of his laboratory were clinically tested in the hospital. Ehrlich felt the need of clinical confirmation in the claims for his new remedy, but it is extremely rare that laboratory workers are able to present such direct or definite evidence as to the value of a therapeutic agent.

We reach conclusions of therapeutic usefulness by a circuitous route: the pathologist tells first what he believes is the nature of the morbid disturbance, the pharmacologist explains how the drug seems to modify the bodily functions, the practitioner tries if the observation of the pharmacologist fits to that of the pathologist as one should expect. It is like a puzzle picture: the color and shape of one piece seems to indicate its juxtaposition to another; but only when they are actually fitted into each other can we be sure that they really do belong together. To change the simile, we build up a system of treatment on the foundation of pathologic hypothesis, using stones of pharmacologic experiments cemented together by deductive reasoning. The clinical imperfections of the structure may or may not be manifest at once. Only after the building has withstood many storms can we be sure of its stability. The weaknesses which develop may be due to the faults in the pathologic or pharmacologic building material, but above all to the weakness of our dialectic binding together.

Perhaps I can make my meaning clearer by concrete examples. The effects of certain drugs in relieving symptoms are so obvious that even the most casual observer can convince himself of their action. Antimony will produce emesis, or pilocarpin increase the secretion of sweat with such infallibility that even the prejudiced observer could not fail to connect cause and effect; but the question of whether the emetic action of antimony is beneficial in pneumonia, as the ancients believed, or whether the diaphoresis produced by pilocarpin is useful in uremia, as we believe, requires nicer discrimination and cannot be answered dogmatically. The commonly accepted theory of uremia is that the symptoms are caused by the retention of some poison in the system, and that by the use of eliminants we bring about the excretion of this poison through other channels. After all, however, it cannot be considered as proved that uremia is due to the retention of a poison, and our theories that purgation and sweating are capable of carrying off this poison are certainly not positively established. But because of our belief in the pathogenesis of this condition, and our faith in the effect of eliminating meas-

ures, we persuade ourselves that we see beneficial effects from the treatment.

It seems to me fair to conclude that we are justified in giving credence to claims of therapeutic usefulness when the known action of the drug permits of a plausible explanation of its asserted benefits, not inharmonious with the accepted theories of the disease and supported by a fair amount of bedside corroboration.

In the absence of a reasonable hypothesis as to the mode of action, a gigantic accumulation of clinical evidence may establish the utility of any therapeutic measure; but when a candidate for therapeutic recognition can present no scientific logic, or only one which is demonstrably erroneous, and its clinical credentials are both vague and scanty, we are certainly justified in regarding its claims with suspicion.

It is my purpose to judge some traditional remedies by the standard set forth; if there is neither reason nor result to appear in defense of a drug, no matter how ancient its lineage may be, I opine it should be relegated to the limbo of all forgotten superstitions.

COMPOUND SYRUP OF HYPOPHOSPHITES.

This preparation, which is so widely employed as a tonic, especially in tuberculous conditions, contains, beside the hypophosphites of calcium, magnesium, potassium and sodium, small quantities of iron, of quinin and of strychnin. The amount of iron in 2 fluidrams of the syrup, which is the pharmacopeial dose, is equivalent to approximately $\frac{1}{20}$ grain, of quinin $\frac{1}{8}$ grain, and of strychnin $\frac{1}{75}$ grain. It is manifest that neither the iron nor the quinin can have any effect on the body, and that the strychnin can have only an infinitesimal hypothetic action. As for the hypophosphites themselves, they owe their introduction into medicine to a Dr. Churchill.⁴ His theory was that phthisis was due to diminished oxidation in the tissues; phosphorus has a strong affinity for oxygen and therefore would attract oxygen into the body, but it is too highly poisonous for remedial use; the hypophosphites, being incompletely oxidized derivatives of phosphorus, would have the same affinity for oxygen, and being only slightly poisonous, could be given in larger dose. As regards this theory it may first be pointed out that there is no reason to believe that there is diminished oxidation in phthisis; in fact it

⁴ For the history of the hypophosphite fallacy see *The Journal A. M. A.*, April 25, 1914, p. 1346.

would seem that it is usually increased; secondly, the hypophosphites pass through the body unchanged, that is, they do not attract oxygen in sufficient quantity to oxidize themselves.

Supposing, however, that Churchill's theory of the cause of tuberculosis were true, it would in no way argue in favor of the use of the compound syrup of the hypophosphites as a practical remedy. An ordinary man burns up from 800 to 1,000 gm. of oxygen a day. It requires about 3 per cent. of oxygen to saturate the earthy hypophosphites; compound syrup of hypophosphites contains, in all, approximately 7.5 per cent. of hypophosphites; therefore 2 teaspoonfuls of the compound syrup of hypophosphites has theoretical attractions for 0.018 gm. of oxygen. To cause an increase of 10 per cent. in the daily consumption of oxygen would require a dose of about 4,000 Cc., or 1 quart four times a day. While it is possible that a patient might survive the hypophosphites in this quantity, he would certainly die of strychnine or quinine poisoning.

Dr. Churchill's theory having been shown to be erroneous, it would require, according to the postulates given above, the most positive clinical evidence to establish his conclusion. In the book of over 250 pages announcing his discovery,⁵ he reports the results of thirty-five cases, of which nine patients were classed as cured, eleven as improved, and fourteen died! Even allowing for the progress which has been made in recent years in the management of tuberculosis, this record seems hardly favorable enough to justify his conclusions as to the specificity of the treatment. As for other clinical evidence, it is equally unconvincing. There has been a relatively small number of papers in medical literature on this subject, and most of those which have appeared are made up almost entirely of such vague generalities as "the treatment has given me good satisfaction." In a brochure published in 1881 by McArthur—who, being commercially interested in this therapeutic measure, is not likely to have overlooked any reports favorable to it—the statement is made that the favorable conclusions are based on 259 cases, certainly not an overwhelming mass of evidence after twenty-three years of clinical trial!

Churchill recommended only the hypophosphite of lime, but Dr. McArthur modified this by adding also the hypophosphites of potassium and sodium and dispensing in the form of syrup. It is interesting to note that the real out and out hypophosphitists maintain that

⁵ Churchill: *Phthisie Pulmonaire*, 1858.

neither strychnine nor iron should ever be combined with the hypophosphites. Nevertheless an English pharmacist by the name of James I. Fellows, about 1870, put on the market a syrup of composition similar to that which is present in the United States Pharmacopeia. The origin of this compound, according to Fellows' claim, was his own personal experience. He had a chronic bronchitis which by some of his medical friends was pronounced tuberculous, although there seems to have been great difference of opinion among the various physicians who examined him as to the nature of his malady. He began to experiment on himself with various combinations of drugs which he imagined might be beneficial. After four years of such self-dosing he completely regained his health and attributed the result to the concoction which is now known as Fellows' Compound Syrup of Hypophosphites.

Fellows' explanation of the *modus operandi* of the remedy is even more remarkable than that of Dr. Churchill. Thus he begins his brochure in 1882 with the words, "This is a combination of salts allied to blood salts, and consequently true hematics, with the blood building iron and the two powerful vegetable tonics strychnine and quinine."⁶ Sodium chlorid is just as nearly "allied to the blood salts" as any salt in his syrup, but one would hardly attribute to ordinary salt any specific virtues in tuberculosis.

On page 8 of the same brochure he says: "The hypophosphorus acid *seems*⁷ to furnish the phosphorus for the construction of lecithin more readily than the stable form phosphoric acid. Consequently . . . the less stable form of hypophosphites can be broken up for the production of free phosphorus for the production of lecithin." In support of this hypothesis he gives not the slightest scintilla of evidence, but goes on the common principle of *nostrum venders* that any assertion made with sufficient dogmatism will be accepted by the medical profession. To the contrary, the investigations of Boddaert,⁸ of Mossol and Gamel,⁹ and of Panzer¹⁰ have shown definitely

⁶ As a further example of the pseudoscientific jargon indulged in by the hypophosphitists, I may quote the following from a paper by Alcindor (Practitioner, London, 1913, xc, 123): "Phosphorus initiates and promotes among the bioplasmic elements, oxidation of the tissues, which is the primordial phenomenon of vitality, with consequent integration and disintegration and elimination of effete products."

⁷ Italics ours.

⁸ Boddaert: *Arch. de pharmacod.*, 1895, ii, 195.

⁹ Mossol and Gamel: *Jour. de pharm. et de chim.*, 1901, xiv, 337.

¹⁰ Panzer: *Ztschr. f. Untersuch. d. Nahrungs-u. Genussmittel*, 1902, v, ii.

that the statement is untrue, the hypophosphites passing through the system and being eliminated by the kidneys as any foreign salt.

An unbiased study of the evidence, it seems to me, must inevitably lead to the conclusion that any therapeutic virtue in the compound syrup of hypophosphites is due to the sugar it contains.

Some skeptical empiricist rises up to ask, If this mixture is so impotent why is it so widely employed? The reasons for its popularity are two: First, and most important, the persistent advertising methods of the manufacturers of certain brands of the compound syrup of hypophosphites, and secondly, its innocuous character. It is better to do nothing than to do the wrong thing, and when the patient insists on having some form of medicine and the physician knows of no drug which is likely to be beneficial, he satisfies the longing of the sick man by ordering the compound syrup of hypophosphites, and salves his conscience with the thought that at least he has done no harm.

LITHIA.

The use of salts of lithium in the treatment of gout was introduced by Garrod.¹¹ He based his application of this remedy on the hypotheses that the gouty paroxysm is due to the deposit of urates in the joint, that this deposit is brought about by a diminished alkalinity of the blood which lessens the solubility of the salts of uric acid, and that lithia by a solvent action on the uric acid prevented the deposit. In support of the latter view he quotes the experiments of Binswanger, who found that one part of lithium carbonate in 120 of water would dissolve four parts of uric acid at the body temperature, and of Uré,¹² who showed that 1 grain of lithia in an ounce of water would dissolve 2.3 grains of uric acid.

Neither his theory concerning the causation of the gouty attacks nor his explanation of how lithium would prevent them can be accepted. In the first place, Magnus-Levy¹³ measured the alkalinity of the blood of twelve patients before, during and after the gouty paroxysm, and failed to find any distinct change in its alkalinity. In the second place, conditions accompanied with severe reduction of the bodily alkalinity, such as diabetic coma or leukemia, do not lead to the deposit of urates. In the third place, acidulating the blood cannot change the solubility of sodium urate without transforming

¹¹ Garrod, A. B.: Gout and Rheumatic Gout, London, 1861.

¹² Uré: *Pharm. Jour.*, August, 1843.

¹³ Magnus-Levy: Harvey Lecture, 1910, p. 269.

it into uric acid, and the deposit in the joints is not of the acid but of the monosodium urate.

As regards the solvent properties of lithium toward uric acid, while it may be regarded as true that relatively concentrated solutions of lithium will dissolve more uric acid than water, yet in proportions in which it can occur in the blood it exercises no such solvent effect. Krumhoff¹⁴ found that water containing 0.012 per cent. of lithium chlorid would *dissolve less uric acid than distilled water*. Roberts¹⁵ says that he has found experimentally that the addition of lithium carbonate in the proportion of 0.1 per cent. or 0.2 per cent. to blood serum had not the slightest effect in enhancing the solvent power of this medium for sodium urate. Good¹⁶ found that the fatal dose of lithium chlorid for the cat was less than 0.4 gm. per kilogram hypodermically. Supposing that the lithium was equally distributed throughout the various tissues of the body, this would mean evidently a concentration of 0.04 per cent. in the blood. It is manifest, therefore, that lithium if given even in fatally toxic doses cannot increase the solvent power of the blood for the salts of uric acid.

Some have attempted to attribute the supposititious beneficial action of lithium in gouty conditions to its diuretic powers or to its antacid action. As to the former, Good found that lithium chlorid has no greater diuretic power than sodium chlorid. As to the alkalizing properties, while it is true that by the administration of sufficient doses of the carbonate or citrate of this base one can render the urine alkaline, the same thing is true of the corresponding salts of either sodium or potassium. Moreover, there is, to say the least, grave doubt as to the real benefit of alkalies in gout. Roberts says, "I have repeatedly administered the bicarbonate and citrate of potash continuously for three or four years in sufficient doses to maintain the urine persistently alkaline, yet I have seen the arthritic attacks recur with apparently unabated regularity."

It is to be noted that even if we accept Garrod's theories, the use of lithium must be limited to cases of typical gout with paroxysmal attacks of arthritis. Even the blind adherence to these improbable hypotheses affords no reason to believe in its usefulness in the various atypical manifestations of disturbed metabolism which we

¹⁴ Krumhoff: Inaug. Diss., Göttingen, 1884.

¹⁵ Roberts, William: On the Chemistry and Therapeutics of Uric Acid Gout and Gout, Croonian Lectures for 1892, London, 1892, p. 129.

¹⁶ Good: *Am. Jour. Med. Sc.*, 1903, cxxv, 273.

are in the habit of attributing somewhat loosely to the uric acid diathesis. By the strange irony of chance, in this country, at least, the use of the salts of this metal is limited almost exclusively to the latter group of cases.

(To be continued)

PHARMACEUTICAL CORPS IN THE MEDICAL DEPARTMENT OF THE UNITED STATES ARMY.

Mr. EDMONDS introduced the following bill in the House of Representatives, July 25, 1917, which was referred to the Committee on Military Affairs and ordered to be printed.

65th CONGRESS 1st SESSION. H. R. 5531.

A BILL

To increase the efficiency of the Medical Department of the United States Army, to provide a Pharmaceutical Corps in that department, and to improve the status and efficiency of the pharmacists in the Army.

Be it an act by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter there shall be attached to the Medical Department of the United States Army a Pharmaceutical Corps, composed of citizens of the United States, to perform the duties defined in this Act and such related duties as may be prescribed, from time to time, by the Surgeon General.

SEC. 2. That the Army Pharmaceutical Corps shall consist of one pharmacist director, with rank of major, who shall be chief of the Pharmaceutical Corps, five deputy pharmacist directors, with the rank of captain, and such number of pharmacists, with the rank of lieutenant, and of pharmacist apprentices, as may be needed for the service,

SEC. 3. That the Army Pharmaceutical Corps shall be charged with the following specific duties: To procure by purchase or manufacture all supplies of medicines, drugs, chemicals, pharmaceutical apparatus, and hospital and surgical dressings necessary for the Medical Department of the Army; to determine the quality and purity of such supplies; to have charge of the medical supply depots of the Army and the storage and safeguarding of such supplies; to provide for the issuance and distribution of such supplies and the

dispensing of medicines in the various hospitals, dispensaries, infirmaries, trains, and camps of the Army; to properly care for, regulate the dispensing, and to systematically account for all spirituous liquors and habit-forming drugs purchased for the department; to procure by purchase or manufacture such drugs, chemicals, reagents, tests, and biologic products as are used in the laboratories and the medical and surgical practice of the department for the purposes of diagnosis, prophylaxis, or treatment; to account for all moneys received from sales of medical supplies, in accordance with the provisions of the Army regulations or disposed of by order of competent authority; to inspect the department's stores and supplies of drugs, medicines, hospital dressings, reagents, tests, and biologic products and determine their deterioration and fitness for use; to coöperate with the other branches of the department in rendering first aid and wound dressing and in the making of diagnostic and chemical tests, to establish and maintain a systematic course of study and training, including the advances made in medicine, pharmacy, and sciences allied thereto, to be pursued by the members of the Army Pharmaceutical Corps who are seeking promotion in the corps.

SEC. 4. That the pharmacist director shall be a graduate of a reputable school of pharmacy, have had not less than five years of pharmaceutical experience, and have established a creditable record in the profession of pharmacy.

The duties of the pharmacist director shall include the following: To have supervision over the Army Pharmaceutical Corps; to see that discipline is maintained and duties are efficiently performed; to formulate rules and regulations, subject to the approval of the Surgeon General, for coördinating the work of the Pharmaceutical Corps with the duties of the other branches of the Medical Department to approve all contracts for supplies procured by the corps; to inspect, either in person or by deputy, all deliveries of supplies and pass upon the purity and quality thereof, and compliance with specifications and the acceptance or rejection; to have the authority to inspect the manufacture of such supplies, and to direct their manufacture in any factory or laboratory that may be taken over by the Government, or that may be established by the Government, for their production; to establish standards for supplies of non-official drugs, chemicals, and preparations, and, where feasible, prescribe the methods of assay for these; to publish, with the approval

of the Surgeon General, formulas for nonofficial preparations, reagents, and tests used in the Army Medical Department, and all formulas so published shall be authoritative in the Army Medical Department; to recommend alternates or substitutes for proprietary, expensive, rare, or unobtainable drugs or preparations; to prepare specifications and estimates for Army medical supplies; to pass upon requisitions for supplies; to provide regulations for the storage, safeguarding, and preservation of Army medical supplies, and the distribution and issuing of such supplies; to see that accounts of the receipts and disbursements of all supplies are properly kept, with special records of the purchases and disposition of spirituous liquors and habit-forming drugs; to have inspections made of the medical supplies, and recommend appropriate disposition of condemned, deteriorated, or unreliable supplies; to preserve the files, correspondence, and official records of the corps; to prepare a syllabus covering a systematic course of professional study to be followed by members of the Pharmaceutical Corps; to coöperate in the professional examinations of applicants for enlistment in the pharmaceutical service, or for promotion within the corps; to recommend transfer of members of the Pharmaceutical Corps and promotion for service or special recognition for distinguished service. He shall outline a course of instruction for pharmacists if an Army pharmacist training school is established

In the absence of the pharmacist director a deputy pharmacist director shall be named as acting pharmacist director. The various duties specified above as within the province of the pharmacist director, with the approval of the Surgeon General, may be distributed or assigned to the deputy pharmacist directors.

The deputy pharmacist directors shall be pharmacists of unquestioned professional repute who are graduates of reputable schools of pharmacy and have had not less than five years pharmaceutical experience.

Any American citizen, graduate of a reputable school of pharmacy, of good moral character and between twenty-one years and forty-five years of age, both inclusive, who can pass the usual physical examination required for appointment in the Medical Corps and the professional examinations, which shall include tests of skill in practical pharmacy and of proficiency in the usual subjects of a standard school of pharmacy course, may be appointed as a pharmacist in the Pharmaceutical Corps.

An original appointment as pharmacist under this Act shall entitle the appointee to the rank and commission of second lieutenant. After the expiration of the first five years of service, with honorable discharge, the pharmacist may reënlist at any time within six months from the date of expiration of such prior service, and he may then apply for examination for promotion, and if his physical examination and the professional examination in subjects of advanced pharmaceutical education are satisfactory, he shall be eligible for promotion to the rank and commission as first lieutenant, Pharmaceutical Corps. After fifteen years of service in the Pharmaceutical Corps a pharmacist with the rank of first lieutenant, Pharmaceutical Corps, may apply for examination for promotion. If he successfully passes the necessary examination in postgraduate pharmaceutical studies, and if in the opinion of the pharmaceutical director such promotion is merited, he shall be promoted to the rank and commission of captain, Pharmaceutical Corps.

Any citizen of the United States between seventeen years and thirty-five years of age, both inclusive, who can pass the necessary physical and preliminary educational examination prescribed by the Secretary of War may enlist as a pharmacist apprentice. Pharmacist apprentices shall act as assistants to the pharmacists and to the Hospital Corps. After serving for one year in this capacity the pharmacist apprentice may, with the approval of the pharmacist or the surgeon under whom he has served, apply for examination for promotion; and if he passes the examination in preliminary education and the elementary pharmaceutical branches, he shall be promoted to the grade of pharmacist apprentice, first class, with rank as sergeant. After five years of service, with honorable discharge, the pharmacist apprentice may reënlist and may apply for examination and promotion to the grade of pharmacist with commission as second lieutenant: *Provided*, That after two years of service the Secretary of War, upon recommendation of the pharmacist director, may grant to a pharmacist apprentice sufficient leave of absence from the service to permit the apprentice attending a school of pharmacy to fit himself for advanced rank in the Pharmaceutical Corps. Such leave of absence shall be without pay, but shall not be deducted in computing the length of service.

The Secretary of War is authorized to appoint boards of three examiners to conduct the professional examinations herein prescribed: *Provided*, That at least one member of each of the boards so appointed shall be a pharmacist.

That, whereas there are now in the service of the War Department a number of pharmacists and druggists ranking as master hospital sergeants, hospital sergeants, sergeants first class, and sergeants, all such shall be eligible to transfer to the Pharmaceutical Corps created by this Act and to the service, rank, pay, and promotion in rank as provided herein, and that the time already spent as pharmacists in the War Department shall be computed as part of their service in the Pharmaceutical Corps.

That in emergencies the pharmacist director, upon the recommendation of the Surgeon General and with the approval of the Secretary of War, may appoint as many contract pharmacists as may be necessary, at a compensation not exceeding \$150 each per month, and provided that the age limit and professional examination may be waived in the case of any contract pharmacist whose character, experience, and professional education is deemed by the pharmacist director to be satisfactory. The temporary appointment of a contract pharmacist shall not carry commission or right of retirement in accordance with the Army Regulations.

SEC. 5. That all appointees authorized by this Act shall take rank and precedence in the same manner in all respects as in the case of appointees to the Medical Corps of the Army, and shall not exercise command over persons other than those in the Pharmaceutical Corps and such enlisted men as may be detailed to assist them by competent authority.

That all officers of the Pharmaceutical Corps shall receive the same pay, awards, and allowances as the officers of corresponding rank and length of service in the Medical Corps of the Army and shall be eligible to retirement in the same manner and under the same conditions.

That the pay of the pharmacist apprentice shall be \$33 per month and that of the pharmacist apprentice first class, with rank of sergeant, shall be \$37 per month, and for each reënlistment in this service they shall receive the usual increase allowed in the Army for honorable discharge and reënlistment.

SEC. 6. That all laws and parts of laws inconsistent with the provisions of this Act be, and the same are hereby, repealed.

PHARMACEUTICAL CORPS IN U. S. ARMY.

BRIEF SUBMITTED TO SURGEON GENERAL GORGAS ADVOCATING THE ESTABLISHING
OF A PHARMACEUTICAL CORPS IN THE U. S. ARMY.

MAJOR GENERAL W. C. GORGAS,
Surgeon General of the U. S. Army,
Washington, D. C.

Dear Sir: On July 24th last, a conference was held at your office between a board of army medical officers, composed of Col. George E. Bushnell, Majors E. P. Wolf, F. F. Russell and Stewart Maguire, and a committee of pharmacists, at which was discussed the proposition that a Pharmaceutical Corps be established as a branch of the Medical Department of the Army.

At the close of this conference, it was agreed that the undersigned should prepare for the consideration of the Surgeon General a formal argument or brief setting forth the views of the pharmacists as to the needs for and the benefits to be obtained by the establishment of the Pharmaceutical Corps.

Pursuant to that agreement, this statement has been prepared and is presented to the Surgeon General with the request that the facts and arguments set forth herein receive his official consideration and with the hope that the importance of increasing the efficiency of the Medical Department by the establishment of a Pharmaceutical Corps will be so impressed upon him that this proposition will merit his approval and endorsement.

PHARMACY A SCIENTIFICALLY DEVELOPED BRANCH OF MEDICINE.

The progress of the medical sciences has necessitated differentiation and specialization and this has separated modern medical practice into various branches, as medicine, surgery, dentistry, veterinary medicine and pharmacy. The pharmacist is now scientifically and systematically trained to fill a specific need of society. Upon the proper performance of the duties of the pharmacist the other practitioners of medicine are compelled to rely. Unless the drugs are properly selected and the medicines properly prepared and dispensed, their skill goes for naught. Upon the faithful and capable performance of the work of the pharmacist depends the

success of the medical profession, and, likewise, the lives of the patients.

American pharmacists hold a prominent position in the world development of their profession. The United States Pharmacopœia ranks as the peer of any national pharmacopœia. In the more recent revisions of this authority, the pharmacists have contributed very largely the chemistry, botany and pharmacognosy of the standards as well as most of the formulas contained therein. The other legal authority for medicines, the National Formulary, has been prepared entirely by a committee of the American Pharmaceutical Association. It is inconceivable that the War Department should ignore this important branch of the medical professions and to-day has not commissioned in its service a single eminent pharmacist. Pharmacy is recognized as the right arm of medicine in civil life and there is no reason why this position is lost in military duty.

The value of pharmacy as a national asset should not be lost sight of, especially in the present exigency, when it must be recognized that the success of our Nation in this war will depend upon the proper utilization of every available talent. It is just as reprehensible to waste talent as to waste materials. The former is as much the property of the citizenship as is the latter and they are entitled to its conservation and the protection which it affords.

THE SOLDIER IS THE ULTIMATE CONCERN OF THE MEDICAL DEPARTMENT.

Those in the military service of the nation are entitled to the very best medical attention that the government can procure. A nation that is proclaimed as the wealthiest and as the most progressive of all nations must not assume any second place in providing means for the preservation of the health and lives of those serving in its army. The people of the United States will expect the Medical Department to adopt the most efficient methods for the conservation of the health and lives of our soldiers and for the recuperation of the unfortunate wounded.

Surgeon General Geo. J. H. Evatt of the British Army very aptly stated: "That the Medical Department existed for the individual benefit of the soldier and if they failed in their duty to him they were not faithfully discharging their obligation. The ultimate soldier was the person whom they all served."

DISPENSING OF MEDICINES IN THE GOVERNMENT SERVICE NOT IN ACCORDANCE WITH STATE PHARMACY LAWS.

The dispensing of potent remedial agents, whether in civil practice or in the military service, should be restricted entirely to those who have been especially educated and trained as compounders and dispensers of medicines. This principle is so thoroughly established that the States, and likewise the District of Columbia and our insular possessions, in the exercise of their police power, have by legal enactment provided for boards of pharmacy to examine and license those to whom authority only is given to compound and dispense medicines.

The Army medical supplies necessarily include such poisonous drugs or their preparations as aconite, atropine, belladonna, cocaine, colchicum, hyoscyamus, morphine, nux vomica, opium and strophanthus. The dispensing of these in the army is not only "done by non-commissioned officers of the Medical Department," but quite commonly by those whose lack of education and training would preclude them from the examinations of any Board of Pharmacy. Surely the soldier is entitled to pharmaceutical service and protection equal at least to that which his State provides for him in civil life.

DANGER IN FOLLOWING THE ERRORS OF THE BRITISH ARMY MEDICAL DEPARTMENT.

Unfortunately, the United States has copied the methods of the British Army Medical Department, whose service has been denounced at home as "obsolete," "incompetent" and "inefficient." Great Britain and the United States are the only two prominent nations whose army medical service does not provide for an organized pharmaceutical corps.

In England this serious defect has been forcefully pointed out and the comparisons made with the well organized and equipped medical and pharmaceutical corps of the continental armies have not been at all creditable to their home government. The "Pharmaceutical Journal and Pharmacist" of London in a recent editorial states: "The British Pharmaceutical Council has already been compelled to report several cases of poisoning that had occurred in hospitals because of untrained dispensers."

The investigations of the causes of the failure of the British

Expedition in Mesopotamia present a most harrowing account of a horrible calamity. The intolerable suffering of the soldiers through the lack of medical attention is not only deplorable, but it is inexplicable that in a modern army, existing under the present status of medical knowledge, such a condition could possibly have occurred. Upon the insufficiency of the medical provisions and the inefficiency of the Medical Department much of the blame for the collapse of this unfortunate expedition is now officially placed. No more striking example of the danger of following obsolete methods could be presented.

READY MADE MEDICINES A SOURCE OF DANGER.

The statement has been officially made that "the pharmaceutical preparations of the Army, especially in time of war, are for the most part in tabloid form; the pharmacy is therefore a matter of dispensing rather than of compounding of preparations." This indicates that pharmacy as practiced in the U. S. Army is very elemental indeed and that even the very basic ideas of professional pharmacy are ignored. Such service must necessarily be far from being satisfactory or efficient or protective of the interests it is supposed to serve.

On the battle line and in the advanced positions, drug dispensing is necessarily limited and confined mainly to first aid. However, in the hospitals and in the convalescent homes and infirmaries treatment is given to many sufferers from disease as well as the wounded and here will be found thousands of cases requiring continuous and extensive treatment and such cases will rapidly multiply as the war is prolonged. To seriously propose that such shall be treated with "canned medicines" in "tablet form" and denied the services of competent compounders of medicines, is certainly not in accordance with our present knowledge of what is essential to conserve life, whether in time of peace or "in time of war."

Tablets are for some purposes a very convenient and useful dosage form, but for many purposes and for many medicines they are absolutely unfitted. Not infrequently, where prompt and reliable action is necessary, the conscientious physician is compelled to select some other form of modification. The most serious evil resulting from this "ready made medicine" and tablet dosage is that too often the patient is made to fit the tablet on hand instead of a remedy being prescribed to fit the needs of the patient. There can

be no question as to the superiority of the individual treatment over this method of "treatment en bloc." The proper method, and the ideal professional method, would be for the physician or surgeon to diagnose each case, prescribe what that patient needs at that time and to have the medicines compounded freshly and dispensed by a competent pharmacist. To do otherwise, is dangerous to the life of the patient and detrimental to the medical service.

COMPARISON OF THE ARMY PHARMACEUTICAL SERVICE OF FOREIGN NATIONS WITH THAT OF THE UNITED STATES.

No one has, as yet, estimated the percentage of mortality in the Army resulting from improper and inefficient medical service. The statistics that have been compiled, however, show that in the past wars, the number of men dying from disease was many times that killed by the enemy. "During the Civil War, the Union Army lost by deaths from disease 186,216 and 93,369 were killed." "In the Spanish-American War of 1898, only 454 Americans were killed and 5,277 died from disease."

In the Russo-Japanese War, the Japanese demonstrated the life saving value of a scientific and systematically organized medical department and the remarkable reduction of mortality from disease and wounds in the Japanese Army during that war attracted world-wide attention.

In the present World War, Germany reports that 87 per cent. of her wounded are returned to the service. This remarkable conservation of life is very properly attributed to the efficient service of her highly trained medical corps and accounts very largely for the ability of the Germans to keep up their vast armies on all the war fronts. It is reasonable to assume that a due share of the credit for this efficient hospital service is due to the German Army Pharmaceutical Corps.

The pharmaceutical service in the German Army was completely reorganized in 1902. Since that date, the pharmacists, in addition to performing purely pharmaceutical duties, have been given charge of the hygienic, chemical and research laboratories of the army and each ranking officer in the Pharmaceutical Corps must have taken the special course in certain official laboratories and have obtained a diploma as a chemist qualified to examine foods.

Each army corps has an associated sanitary corps under the con-

trol of an apothecary officer who has charge of the pharmaceutical service and supplies and is the director of the laboratory connected with that corps. Each army corps has likewise a supply depot and a manufactory of supplies which furnishes the medicines and dressings for that army corps. The medicines kept in hand for the hospitals include nearly all the official pharmaceutical preparations.

The commander of the German Army Pharmaceutical Corps is the Oberstabsapotheker who is attached to the Medical Section of the Prussian Minister of War and his rank is equal to that of a general of a brigade.

France has an organized Army Pharmaceutical Corps, the commander of which is called the inspector and with rank as brigadier general. The complete organization includes the titles of principal pharmacists, pharmacists, pharmacist-majors and assistant pharmacist-majors and ranking as colonels, lieutenant colonels, majors, captains and lieutenants. When the French peace army of 500,000 men was rapidly increased to 3,500,000 trained soldiers, the pharmaceutical corps was automatically increased from the pharmacists in reserve, many of whom had already held commissions and had experience in the sanitary corps.

In January, 1915, over 1,200 of the mobilized pharmacists who had the necessary experience and training in the service, were commissioned as first class assistant pharmacist-majors, ranking as lieutenants. The pharmaceutical corps in France manufactures many of the army supplies and is charged with the chemical examination of water, foods, and army supplies and a pharmacist of rank is attached to the Sanitary Council of each military district.

In Spain, as early as 1813, the Military Pharmacy Corps was promulgated. Despite the several changes and reorganizations of the Sanitary Corps that have taken place in that country since that date, the organization has been continued and its work made more comprehensive and beneficial. Its personnel comprises inspectors, sub-inspectors, pharmacist-majors, pharmacists of the first class and pharmacists of the second class and with commissioned rank from colonel to lieutenant.

In Japan, "the Army has a Sanitary Supply Department and the Director of this Department is equal in rank to a Colonel and wherever there is a Barrack, it has a field hospital, which has a Department of Pharmacy and the Director of this pharmacy is equal in rank to a lieutenant colonel. The rank of pharmacists in the Army is from a sub-Lieutenant to a Colonel."

In the United States Army we have no Pharmaceutical Corps whatever. We have no pharmaceutical supervision of medicines and hospital supplies. We have no governmental manufacture of medical supplies for the Army under the supervision of trained pharmacists. We have no specially trained pharmacists to attend to the dispensing and compounding. We have absolutely nothing that bears any semblance to a modern army pharmaceutical corps.

We have it officially stated that in the United States Army "the dispensing of drugs or compounding of prescriptions is done by the non-commissioned officers of the Medical Department." Many of these, as pointed out, could not qualify to practice pharmacy in civil life. Can the United States afford to have an Army Medical Department and service that is inferior to that of Spain or Japan? Can those in authority continue to ignore the value of the services of the pharmaceutical corps in foreign armies and the potent lessons of efficient organization?

An order has just been published by the adjutant general for the reorganization of the Army of the United States in conformity with the organization of the French Army. If we find the French models for the line troops worth following, it is reasonable to suppose that we should likewise follow their organization in the Sanitary Service, including the medical and pharmaceutical corps.

EFFICIENCY OF THE MEDICAL CORPS DEMANDS PHARMACEUTICAL ASSISTANCE.

The advice of Cicero to "Let each one exercise himself in the art which he knows" is but a more ancient expression of the doctrine of "every one to his trade and the right man in the right place." This principle is the very foundation of modern efficiency which is now demanded in every occupation. War is the supreme test of a nation's efficiency and in time of war it is of paramount importance that every man be put to that work in which he can render the most useful service to the nation. The magnitude of modern warfare demands the most perfect organization and the most effective service and nowhere is this of more importance than in the medical service of the Army and Navy.

Each line of activity requires specialized education and training and to permit one branch or activity to encroach upon the special field or duty of another means national inefficiency, if not actually

national suicide. To place a skilled army surgeon in charge of a medical supply depot to look after the procuring and distribution of medical and hospital supplies and the accounting thereof is, to say the least, wasteful of his special talent that may be sorely needed elsewhere. The military surgeon has more than enough to do, to attend to the strictly medical needs of the sick and wounded and to make the necessary examinations and reports.

The medical profession is now asking for higher rank for the Medical Corps of the Army and the increased authority that accompanies rank in the military service. Attention is likewise being directed to the need for skilled and adequate assistance and for relief from the non-medical work imposed upon the Medical Corps. In a recent article Dr. J. Madison Taylor writes:

"In my judgment there is grave peril that in the near future the demands upon the medical service will be so many and serious that it may break down from overwork. It is to prevent this, to anticipate, that we make the constructive suggestion, that steps be taken immediately to provide a sufficient number of assistants skilled in all these branches of service required for the Medical Corps.

"The medical man of the Army and Navy comes nearest to realizing this symbolic and wholly imaginary embodiment of omniscience, but in view of the terrific demands made upon him by modern warfare in time and work, if ever a man needed skilled and adequate assistance he is the man, and yet our Army and Navy is proceeding in the upbuilding of its medical service along the old, old lines of expecting the medical men to 'do it all.' The military service of France, Germany, Japan and other countries gives its medical men proper and sufficient assistance. We should do no less; we ought to do more."¹

It is very appropriate that the medical profession, in this time of exigency, should recognize that pharmacy is the rational support of medicine and that the pharmacist, specially educated in the collateral medical sciences and skilled by years of practical training, is prepared to give that assistance and support that is needed by the Medical Corps.

It is very gratifying to note that the leaders in the medical profession are outspoken in their support of pharmacy as a necessary

¹ "Give the Military Surgeon Skilled and Adequate Assistance. He cannot do it all." J. Madison Taylor, M.D., *New York Medical Journal*, July 21, 1917.

branch of the military medical service and in favor of its proper recognition with commissioned rank.

In a recent letter to President F. J. Wulling, of the American Pharmaceutical Association, President Charles H. Mayo, of the American Medical Association, writes:

"I was very glad to see the action taken by the House of Delegates in recommending recognition of the pharmacists, and I hope it will bear fruit in advancing the recognition of the great benefits which can be derived from the use of pharmacists in the Army service."

The *Journal of the American Medical Association*, on June 16, 1917, editorially commented:

"So far as official recognition of it is concerned, the science and art of pharmacy might not exist for the Army. To-day, as never before, victory in war goes to the nation that most effectively conserves the health of its fighting men. The physician is now of such military importance that the medical profession will be called on to make no inconsiderable sacrifices. It will materially lighten the arduous duties and responsibilities of the physician to have in the Army trained pharmacists who will be able to give intelligent cooperation. But it is imposing too great a strain on the patriotism of those whose special knowledge is obviously a large asset to the Army, to expect them to enlist as privates without any recognition of their national worth. Pharmacists should be given a rank commensurate with their importance, first because it is but simple justice to the pharmacists themselves, secondly, because the usefulness of the Medical Corps will be greatly augmented and, lastly, and most important, because the efficiency of our Army demands it."

THE DUTIES OF THE PHARMACEUTICAL CORPS.

In the absence of any attempt in the past to organize the pharmaceutical service in the Army, the duties that might be assigned to a Pharmaceutical Corps can only be tentatively outlined. The provision of the various foreign army pharmaceutical corps will furnish excellent models for the duties of such a corps. These have been very generally followed in the fairly comprehensive line of duties stated in the bill introduced by Congressman Edmonds, entitled

"A Bill to Increase the Efficiency of the Medical Department of

the United States Army, to provide a Pharmaceutical Corps in that department, and to improve the status and efficiency of the pharmacists in the Army" (H. R. 5531).

No doubt the experience of other nations will be duplicated in that the duties assigned to the Pharmaceutical Corps will rapidly increase, and with such increase of duties the corps will grow in usefulness and importance. Eventually, it may be placed in control of not only the providing, manufacturing and distributing of pharmaceutical and hospital supplies, but also, as in foreign countries, of the various hygienic, chemical, analytical and research laboratories of the Army.

NO RADICAL REORGANIZATION CONTEMPLATED.

The formation of a Pharmaceutical Corps in the Army Medical Department, as provided for in H. R. 5531, does not contemplate any radical changes or reorganization of the Department. By a readjustment of the regulations, the Medical Corps can be relieved of its burden of non-medical duties, records and accountings. The Pharmaceutical Corps should be promptly organized to take up its various duties and to coördinate its work with that of the medical, dental, veterinary and nurse corps of the military service.

Respectfully submitted,

GEORGE M. BERINGER,

*President National Pharmaceutical
Service Association.*

JOSEPH W. ENGLAND,

*Committee on National Defense,
American Pharmaceutical Asso-
ciation.*

REPORT OF THE SIXTY-FIFTH ANNUAL MEETING OF THE AMERICAN PHARMACEUTICAL ASSOCIATION

BY PROF. CHARLES H. LA WALL.

The Indianapolis Meeting of the American Pharmaceutical Association, held during the week of August 27, was one which will long be remembered for many good and worthy reasons.

It was a meeting peculiarly representative of all that is good in

the "body pharmaceutic," to use a happy phrasing introduced by President Wulling in his annual address to designate the entire grouping of associations connected with pharmacy.

From east and west, from north and south assembled pharmacists, retail, wholesale and manufacturing; pharmaceutical educators; members of pharmacy boards, pharmaceutical journalists, government officials and others, to discuss problems and take action upon questions affecting the progress of the profession, and thus, indirectly, the welfare of the public at large.

The enrollment, which reached a total of more than 300 members and others interested, was not far below that of the Atlantic City Meeting of 1916 and was contributed to by the fact that Indianapolis is very nearly the geographical center of the United States. As usual the concurrent meetings of the National Association of Boards of Pharmacy and of the American Conference of Pharmaceutical Faculties were held during the same week. The former body was ably presided over by President Lawrence C. Lewis, of Tuskegee, Ala., who was assisted by Secy. H. C. Christensen, of Chicago, Ill. Meetings were held on Monday, August 27, at 9.30 A.M.; 2.00 P.M. and 8.00 P.M. and on Tuesday, August 28, at 9.30 A.M. Joint meetings with the American Conference of Pharmaceutical Faculties were held on Tuesday, August 28, at 10.00 A.M. and 2.00 P.M. and a combined meeting with the Section on Education and Legislation of the A. Ph. A. and the Conference of Faculties on Friday, August 31, at 2.00 P.M.

Many excellent papers were presented and discussed at these meetings. The officers of the National Association of the Boards of Pharmacy elected for the ensuing year were: President, W. P. Porterfield, Fargo, N. Dak.; vice-presidents, John A. Weeks, Bal-linger, Tex.; W. R. Jarrett, Oklahoma City, Okla.; George D. Newcome, Creston, Ia.; secretary, H. C. Christensen, 450 Bowen avenue, Chicago, Ill.; treasurer, Charles H. Skinner, Windsor, Vt.; chairman of the advisory examination committee, H. C. Christensen, Chicago, Ill.; members of the executive committee, E. G. Cox, Craig, Mo., John Culley, Ogden, Utah, and H. E. Purdy, Derby, Conn.

The American Conference of Pharmaceutical Faculties was in session during Monday and Tuesday. President R. A. Lyman, of Nebraska, read a very interesting address, which contained some very radical recommendations and was referred to a committee

consisting of W. C. Anderson, of New York; C. E. Caspari, of Missouri, and C. A. Dye, of Ohio. Among the recommendations was one regarding preliminary training of pharmacists, which was settled after much discussion by the adoption of September 1, 1923, as the date for the inauguration of a four-year high school entrance requirement by the colleges who are members of the conference.

There were fifteen recommendations altogether, most of which were concerned directly with the work of the Conference itself.

The newly elected officers of the Conference for 1918 were: President, Henry Kraemer, of Philadelphia; Vice President, Charles E. Caspari, St. Louis; Secretary and Treasurer, Thos. J. Bradley, Boston; Chairman of Executive Committee, R. A. Lyman, Lincoln, and F. J. Wulling, Minneapolis; Syllabus Committee, A. Bolenbaugh, Richmond.

The general sessions of the American Pharmaceutical Association were three in number. They were held on Tuesday, August 28, at 8.00 P.M., on Thursday, August 30, at 2.30 P.M., and on Saturday, September 1, at 10.00 A.M. At the first of these sessions President Wulling read his address, which was a scholarly production, filled with food for thought and discussion. The keynote of the address, and the principal one of the few recommendations which were contained in it, was a series of convincing arguments showing the need for a federation of all pharmaceutical organizations with permanent headquarters, resident officers, a substantial endowment fund and the support of what President Wulling aptly termed the entire "body pharmaceutic."

Another recommendation was for winter meetings to replace the present summer gatherings. This address was referred to a committee consisting of H. V. Army, chairman, Charles E. Caspari, R. A. Lyman, Julius A. Koch and Charles H. LaWall.

The committee reported favorably on the recommendation for the establishment of a committee looking toward the proposed federation, and urged the reference of the matter of winter meetings to the members at large. The reports of the officers and committees of the general association were comprehensive and satisfactory and show the association to be in an active and flourishing condition.

At the second general session was presented the report of the committee on President's address for 1916. J. H. Beal, chairman, read the report, which completely vindicated the officers of the association from the charges and innuendoes contained in the address, accompanying the report with much documentary evidence

taken from the proceedings and files of the association. The committee recommended that the address be released for publication upon condition that any journal publishing it be required to publish, in full, the report of the committee concerning it. After some discussion it was decided to drop the entire matter from publication and to file the address and the committee's report in a safe place in the archives of the association.

At the second session the following report of the nominating committee was presented for election by ballot by mail in the usual manner:

Nominees for President: J. A. Koch, Pittsburgh; Chas. H. LaWall, Philadelphia; and Leonard H. Seltzer, Detroit, Mich.

Nominees for First Vice-President: F. W. Nitardy, Denver, Colo.; E. A. Ruddiman, Nashville, Tenn.; and Jacob Diner, New York.

Nominees for Second Vice-President: T. J. Bradley, Boston; W. W. Stockberger, Washington, D. C.; and H. C. Christensen, Chicago.

Nominees for Third Vice-President: Frank Schachleiter, Hot Springs, Ark.; L. C. Lewis, Tuskegee, Ala.; and Francis C. Hemm, St. Louis, Mo.

Nominees for Members of the Council: Three to be elected: Chas. Holzhauer, Newark, N. J.; W. J. Teeters, Iowa City, Ia.; C. B. Jordan, Lafayette, Ind.; Caswell A. Mayo, New York; R. A. Lyman, Omaha, Neb.; Chas. E. Caspari, St. Louis; O. F. Claus, St. Louis; G. F. Payne, Atlanta; and John C. Wallace, New Castle, Pa.

At the final general session the minutes of the council were read and approved, except as to the subject of pharmaceutical research. In this matter the recommendation of the scientific section that a permanent research committee of ten members, with terms of five years each, be appointed by the council, was adopted. Among the important features of the council minutes as approved was the provision that 50 per cent. of the net profits from the sale of the National Formulary should be set aside and be called the American Pharmaceutical Association Research Fund.

At this session President Wulling installed the officers elect, as follows: President, Charles Holzhauer; First Vice-President, Alfred R. L. Dohme; Second Vice-President, Leonard A. Seltzer; Third Vice-President, Theodore J. Bradley; Members of the Council, Frederick J. Wulling, George M. Beringer, and Jacob Diner, New York, N. Y.

Appropriate resolutions of thanks were extended to the retiring officers and to the various local committees who had aided in making the meeting a success.

The various sections of scientific and educational character were well provided with interesting programs, as will be evidenced by the following schedule of officers and programs:

SCIENTIFIC SECTION.

Officers: Chairman, J. L. Turner; First Vice-Chairman, B. L. Murray; Second Vice-Chairman, A. W. Linton; Secretary, W. W. Stockberger.

Committee on Ebert Prize: Julius A. Koch, Pittsburgh, Pa., Chairman; Hermann Engelhardt, Baltimore, Md.; Chas. W. Ballard, New York, N. Y.

The following papers were presented: "Biological Products from the Pharmacy Point of View," L. E. Sayre; "Magnesium Sulphate—Its Pharmacological and Therapeutic Actions," Jacob Diner; "Rabies," E. G. Stewart; "Standardization of Digitalis," H. C. Colson, Jr.; "Solubility of Phosphatic Kidney Stones," W. F. Rudd and E. V. Greever; "The Significance of Cretinin and its Colorimetric Determination in Urine," W. F. Gidley; "The Microchemistry of the Alkaloids of *Datura Stramonium*," Chas. O. Lee; "Soy Bean Oil," E. V. Howell; "A New Method of Extracting Drugs for Alkaloidal Assaying," W. M. Maske, Jr.; "An Improved Method of Assaying Opium," W. M. Maske, Jr.; "Sulphur—Its Production and Use" (Illustrated with Lantern Slides), M. A. Mansbach; "Scientific Drug Farming" (Illustrated with Motion Pictures), H. C. Fuller; "The Cultivation of Drug Plants" (Illustrated with Lantern Slides), John A. Borne-man; "Drug Cultivation" (Illustrated with Lantern Slides), F. A. Miller; "Breeding of Medicinal Plants," F. A. Miller; "The Cultivation of Henbane," N. R. Mueller. Symposium on Drug Plant Growing—Discussion opened by W. W. Stockberger, followed by Edward Kremers, E. L. Newcomb, F. A. Miller, H. C. Fuller and others. "Tolu and Sugar Coating in the Disguising of Medicines," Bernard Fantus; "Borax and Boric Acid," H. L. Harris; "The Analysis of Borax Soaps for the Borax Content," K. F. Ehmann and Joseph Harrison; "Tincture of Cantharides" (Fourth Paper), W. L. Scoville; "The Constituents of Senna Beans," W. L. Scoville; "The Microanalysis of Malted Milks," C. W. Ballard; "The Rela-

tions of the U. S. P. and N. F. to Food Standards," C. W. Ballard; "The Inversion of Sugar in U. S. P. Syrup," G. W. Lloyd Plette; "On the Deterioration of Crude Indian Cannabis," C. R. Eckler and F. A. Miller; "Apparent Deterioration of Donovan's Solution," Joseph Rosin.

SECTION ON PRACTICAL PHARMACY AND DISPENSING.

(Pharmacopœias, Formularies and Standards.)

Officers: Chairman, W. H. Glover; Secretary, David Stolz; Associates, Mrs. St. Claire R. Gay and Charles W. Holzhauer, Jr.

In addition to the chairman's address and reports of committees the following papers were read: "Liquors of the U. S. P. and N. F.," Edward Kremers; "Vaccine Therapy in the Light of Facts," A. M. Rovin; "The Tyranny of the Teaspoonful," H. V. Army; "A Study of Percentage Solutions," T. J. Bradley; Prescription Clinic—E. Fullerton Cook, Ivor Griffith and Charles H. LaWall; "The Carrel-Dakin Solution Pharmaceutically and Physiologically Considered," Mrs. St. Claire Ransford Gay; "The Original Package," L. E. Sayre; "Elixir Iron, Quinine and Strychnine Phosphates," W. H. Glover; (a) "Manna as an Excipient for Soft Mass Pills." (b) "Disintegration of Pills," William Maske, Jr.

SECTION ON COMMERCIAL INTERESTS.

Officers: Chairman, P. Henry Utech; Secretary, Robert P. Fischelis; Associates, A. H. Ackermann, S. K. Sass and J. H. Webster.

Address of Chairman, P. Henry Utech; "Commercial Possibilities in Professional Pharmacy" (Illustrated Lecture), Henry Kraemer; "Drug Store Dynamics," H. S. Noel; "The Commercial Aspect of Vaccine Therapy," A. M. Rovin; "The Preceptor—An Asset or a Liability," F. M. Apple; "A Novel Method of Handling Ice Cream," G. H. Grommet; "Net Profits and the Average Sale," Clyde L. Eddy; "Conserving Life by Eliminating Waste," Robert P. Fischelis; "More Profits Within Your Reach," W. W. Figgis; "Capitalize Your Responsibility," J. C. Peacock.

SECTION ON EDUCATION AND LEGISLATION.

Officers: Chairman, R. A. Kuever; Secretary, C. B. Jordan; Associates, H. V. Army, Arthur W. Linton and John Culley.

Address of the Chairman, R. A. Kuever; Report of the Secretary, C. B. Jordan; Report of the Committee on Patents and Trade Marks, F. E. Stewart, Chairman; "Pharmacology and the Recognition of Professional Pharmacy by the United States Government," F. E. Stewart; "Military Recognition of the Pharmacist," L. E. Sayre; Report of the Committee on Drug Reform, L. E. Sayre, Chairman; Report of the Committee on National Legislation, John C. Wallace, Chairman; Report of the Committee on Regulation for the Transportations of Drugs by Mail, Benj. L. Murray, Chairman; "Iowa's Prerequisite Law," J. M. Lindly; "The School of Pharmacy and the Profession," C. F. Nelson; "Graduate Pharmaceutical Work," Edward Kremers; "What Compulsory Health Insurance Will Mean to the Druggist," Harry B. Mason; "Some Ideas About the Teaching of Practical Pharmacy," Zada M. Cooper; "Pharmaceutical Journals," Robert P. Fischelis; "Fallacies in Popular Psychology of Salesmanship," Chas. O. Lee; "The U. S. P. IX and N. F. IV as Text Books for Pharmacognosy," W. F. Gidley; A Paper, F. W. Nitardy; "A Bad Spell, or, Who Mixed the Letters," Charles H. LaWall; Report on the Work of the Voluntary Conferences for the Drafting of Modern Laws Pertaining to Pharmacy, Frank H. Freericks, Chairman.

Joint Session of the Section with the American Conference of Pharmaceutical Faculties and the National Association of Boards of Pharmacy.

Rufus A. Lyman, President American Conference of Pharmaceutical Faculties.

Lawrence C. Lewis, President National Association of Boards of Pharmacy.

Report of the Eighteenth Annual Meeting of the American Conference of Pharmaceutical Faculties, by its Secretary, Wilber J. Teeters; Report of the Fourteenth Annual Meeting of the National Association of Boards of Pharmacy, by its Secretary, H. C. Christensen; Presentation of Resolutions adopted by the A. C. P. F. and N. A. B. P., For Discussion; "The State Legislature," W. H. Cousins; "Are Colleges of Pharmacy Devoting Sufficient Time to Prescription Laboratory Practice?" A. W. Linton; A Paper, Edward Spease; Further Reports and Discussion on the Work of the Voluntary Conference for the Drafting of Modern Laws Pertaining to Pharmacy, Frank H. Freericks, Chairman.

SECTION ON HISTORICAL PHARMACY.

Officers: Chairman, W. L. DuBois; Secretary, L. E. Sayre; Historian, E. G. Eberle.

Address of the Chairman, W. L. DuBois; Report of the Historian, E. G. Eberle; Report on the Indianapolis Historical Exhibit, E. G. Eberhardt; "Eli Lilly, His Relations to Historical Pharmacy in the State of Indiana," J. K. Lilly; "Historical Pharmacy of Indianapolis," Frank H. Carter; "History of American Ginseng," Edward Kremers; "History of New Jersey Pharmaceutical Association (for the Year of 1916)," Edward A. Sayre; "Chicago Veteran Druggists' Association," Wilhelm Bodemann; "Antique Mortars," Caswell A. Mayo; "Observations and Experiences in Pharmacy Extending over Sixty Years," John F. Hancock; "Sketch of Maryland College of Pharmacy Since the Incorporation in 1841," John F. Hancock; "Purdue University School of Pharmacy," W. F. Gidley.

HOUSE OF DELEGATES, A. Ph. A.

Officers: Chairman, J. H. Beal; First Vice-Chairman, S. C. Henry; Second Vice-Chairman, O. F. Claus; Secretary, Jeannot Hostmann.

Sessions: Wednesday, August 29, 4.00 P.M.; Thursday, August 30, 4.00 P.M.

Roll call; Appointment of Committee on Resolutions; Reading of Communications; Chairman's Address, J. H. Beal; Report of Secretary, Jeannot Hostmann; Reports and Resolutions; Miscellaneous Business; Unfinished Business; Report of Committee on Resolutions; Election and Installation of Officers; Adjournment.

WOMENS' SECTION.

Officers: President, Mrs. E. A. Ruddiman; Honorary President, Mrs. John F. Hancock; First Vice-President, Mrs. E. Fine; Second Vice-President, Mrs. G. M. Beringer; Third Vice-President, Mrs. Fletcher Howard; Secretary, Mrs. Jean McKee Kenaston; Treasurer, Mrs. Franklin Apple; Historian, Miss Bertha Ott; Chairman of Executive Committee, Mrs. G. D. Timmons.

Invocation; Chairman's Address, Mrs. E. A. Ruddiman; Appointment of Committees; Report of the Secretary, Mrs. Jean McKee Kenaston; Report of the Treasurer, Mrs. Franklin M. Apple; Reports of Standing Committees; Reports of Special Committees; "Teaching the Public," Miss Zada Cooper; "Chemistry of the Household," Miss Mary Creighton; "Problems in the Druggist's

Home," Mrs. W. B. Philip; "Some Social Service Aspects of the Hospital," Miss Bertha Ott; "How Pharmacists' Wives May be of Service to Their Country," Mrs. David F. Jones; "A Talk," Dr. H. V. Army.

A glance at these simultaneous activities will convince even the most cursory observer that one of the needs of the association is simplification along lines which will prevent the distractions now strongly reminding one of a three ring circus where one is trying to see everything at once.

It may be that pharmacists, being more versatile, are actively interested in several of these lines of endeavor, but some way should be found so that the conflict of duties and responsibilities does not become so apparent. At one or two periods during the week the interest and success of the general session was jeopardized by the synchronous meetings of sectional or subsidiary organizations.

Besides all the regular scheduled meetings there were pleasure trips for visiting members, a visit to the Lilly laboratories which are models of modern pharmaceutical progress on the large scale, trips to various industrial plants and an evening spent at a play written and produced by local pharmaceutical talent in which the hits were clever and were very much appreciated. Taking it all together, the 65th annual meeting will have an enduring influence upon the progress of pharmacy for the harmony and advancement which were noteworthy features. The meeting for 1918 will be held in Chicago at a time to be selected by the council.

NEW ZEALAND GRAPE INDUSTRY.

According to Consul General Alfred A. Winslow, Auckland, grapes are not very successfully grown in the open in New Zealand since the climate is too moist and cool to allow the fruit to fully mature. There are about 390 acres of vineyards under cultivation, located in the most favorable spots of the Dominion, where limited quantities of middle-quality grapes have been grown, but the grape is not considered a profitable crop. Some most excellent table grapes are grown in this Dominion, but in the vine houses instead of in the open air. There are about 800 of these vine houses in New Zealand, and all seem to be doing a thriving business, especially in the South Island, where practically no grapes are grown in the open. Grapes grown under glass retail here for 36 to 48 cents a pound and always find a ready market.

M. G. S.

THE AMERICAN JOURNAL OF PHARMACY

NOVEMBER, 1917

EDITORIAL.

THE POLICY OF THE AMERICAN JOURNAL OF PHARMACY.

The AMERICAN JOURNAL OF PHARMACY was established by the Philadelphia College of Pharmacy in 1825. This ambitious organization, which had been founded but four years earlier, already realized the need of an American drug journal. The primary purpose to be served by such a publication was the education and professional advancement of those engaged in the calling. It was not only to promulgate the views of the membership of the College and to permanently record its activities but, far more important, it was to disseminate useful information presented in original contributions, researches and essays and in selected published articles so as to extend the knowledge of those engaged in the drug business and the professional services of pharmacists.

It was very fortunate that the initial direction of the AMERICAN JOURNAL OF PHARMACY was under the editorship of Daniel B. Smith. Under the wise guidance of that talented author, versatile scientist and public-spirited pharmacist, this publication was established on a high plane as an ethical journal devoted to the pharmaceutical sciences. The editorial successors of Daniel B. Smith have been Dr. Benjamin Ellis, Dr. Robert Eglesfeld Griffith, Dr. Joseph Carson, Prof. Wm. Procter, Jr., Prof. John M. Maisch, Prof. Henry Trimble and Prof. Henry Kraemer. Each of these held an eminent position in his chosen field of scientific and professional study and each incumbent of the editorial chair has efficiently sustained the prestige of the JOURNAL.

Changes are inevitable, and the resignation of the editorship by Prof. Henry Kraemer, due to his acceptance of a chair in the faculty of the University of Michigan, is regretted by the Com-

mittee on Publication. He carries with him to his new sphere of labor the best wishes of his associates and colaborers in pharmacy and of the management, and of the subscribers of the AMERICAN JOURNAL OF PHARMACY.

Quite naturally, the pages of a journal reflect the personality of the editor and his viewpoint as to the needs of his readers. The incumbent upon whom has fallen, unexpectedly, the editorial management for the time being, shall endeavor to maintain a broad horizon so that this JOURNAL will serve in the widest and best sense the diversified interests of pharmacy, whether they tend to progress along any of the lines that we denominate as educational, legislative, scientific, practical, or commercial.

The pages will be open to correspondents for the proper presentation of any subject pertaining to pharmacy. The importance of many of the questions confronting the nation or affecting the interests of the drug trade justify editorial consideration. Whatever changes may be made in the presentation of subject matter, the readers of the AMERICAN JOURNAL OF PHARMACY are assured that the scientific standing and policy of this, the oldest journalistic advocate of and consistent exponent of the ethical practice of pharmacy through a long and memorable career, will not be changed.

G. M. B.

THE NEWER ANTISEPTICS.

Every great event influences the practices of the world in proportion to its importance; so the world war, as one of the greatest events in the history of the world, is having a prodigious effect on practically every avenue of human activity on the face of the globe. To medicine it is bringing newer and larger problems than have ever before been presented. The solution of these calls forth new theories, extensive study, research and experimentation.

Not the least of the medical problems of the war has been the treatment of the numerous wounds, many of which, from the very character of the warfare, are seriously infected. While the basic teachings of Lister on aseptic surgery are firmly established and are followed, the surgeons have been confronted by an alarming situation calling for improvements on the methods and agents formerly employed.

The surgeons vying with each other in their efforts to determine the best methods and agents to establish and maintain aseptic con-

dition of wounds, have experimented, on the unprecedented scale possible, with numerous new formulas and chemicals. As a result medical practitioners are confused by the conflicting reports and claims set up for many new products, each advocated by a sponsor as possessing superior antiseptic properties and probably each of these, under the conditions applied by the skilled surgeon, has given good results. The law of the survival of the fittest will, doubtless, finally determine which of these will meet with continued favor and extended use.

The duty of the pharmacist is to study all of these formulas and methods of producing asepsis as they appear in the literature and to be prepared to intelligently give information thereon and likewise to properly prepare and supply any of the products. The present number of the AMERICAN JOURNAL OF PHARMACY presents a journalistic symposium on the newer antiseptic treatments. The purpose has been to bring together all of the salient features of the various contributions on this subject that have appeared in the medical and pharmaceutical literature, so that the busy physician and pharmacist will have in a condensed form the authoritative information on the subject.

For other important articles on the Carrel-Dakin Solution the reader is referred to February, 1917, number, page 84, and to the September, 1917, number, page 396, and to a note on the preparation of dichloramin-T in September, 1917, number, page 419, and to the abstracts in the present number. From time to time, additional information will be supplied in these pages.

G. M. B.

PROPER PHARMACEUTICAL SERVICE A MILITARY NECESSITY.

Modern warfare has demonstrated that superiority of brute force alone is not sufficient to determine victory. Ingenuity and the intelligent and energetic application of every resource at the command of the nation are recognized as potent factors in determining to which side will fall the laurel of achievement, the glory of victory. There are many ways of rendering war service to the nation, other than fighting, and everything that tends to the health, comfort and efficiency of the men in arms is a direct benefit to the nation and an aid to early victory and that world peace that we pray will follow this world war.

To conserve the health of the soldiers and to recuperate the sick

and wounded by the utilization of the most scientific and approved method and to thus increase the percentage of human salvage and maintain the army at its maximum efficiency, is now acknowledged by intelligent commanders to be an imperative need of the modern army. Japan and the European continental countries, such as France and Germany, who have maintained efficient armies have recognized the importance of taking advantage of and using to the fullest extent the scientific knowledge of pharmacists and their special training along professional and commercial lines.

Those responsible for the organization and service of the Medical Department of our national military service, cannot continue to ignore the disparity existing between the pharmaceutical service assured to the French soldier and that stintingly granted to his American ally now fighting as his compatriot. A comparison between the highly scientific and important, pharmaceutic, hygienic and chemical services performed by the French military pharmacists and the very limited pharmaceutical service permitted to be exercised in the American army is not at all creditable to the Medical Department of the Army. Obsolete methods of dispensing and the lack of any pharmaceutical organization or control of army medication can only be considered as incongruous and incompatible with the standing and dignity of the United States and with the status of the medical practices in America.

Pharmacists are fully justified in insisting that there shall be organized pharmaceutical corps in the government service, through which the members of this branch of the medical profession can render most efficiently their proper services to the nation. The pharmacists of the United States are not less competent than those of foreign countries nor are they less patriotic, and, if given a chance to develop, the military chemists and pharmacists will, undoubtedly, as in other branches of their professional services, vie with the most advanced of foreign nations.

That the War Department continues to entrust the dispensing of medicines in the army to men who lack the special education and experience required of pharmacists in civil practice is inexplicable. This foolhardy exposure of our soldiers to the grave danger of untimely death from poisoning is as untenable as it is unwarranted and is an inexcusable national blunder. Instances already reported prove this to be a serious menace to life and not an imaginary danger.

The responsibility must be fixed for this failure to mobilize the pharmaceutical asset of the nation and to organize this into a pharmaceutical corps that will give to our soldiery a proper medical dispensing service; a service worth having.

It is in order for the Department to explain to the satisfaction of the citizens of the United States why their kinsmen and loved ones whom they are sacrificing to the cause of the nation are not given the same care, attention and the scientific, hygienic and pharmaceutical service provided for the soldiers in the modern armies of both our allies and enemies.

The necessity for organized pharmaceutical service in the Army was conclusively proven by the Japanese in the Russo-Japan War and in the present gigantic conflict has been demonstrated again by both France and Germany. The lack of such proper and needed service in the American Army can no longer be attributed to ignorance and this nation cannot continue to condone blind jealousy or medical indifference to the functions of pharmacy.

G. M. B.

THE ANTISEPTICS AND THE WAR.

BY LOUIS GERSHENFELD, P.D., B.Sc.

The treatment and prevention of infection have been studied for centuries and, even as far back as 1756, a book was published by Smollett in which he discussed this subject. Sterilization and antiseptic methods have undoubtedly been greatly improved since the day of Smollett, but the improvements effected have not yet reached perfection and these remain as serious factors in the present world war.

At the beginning of the present conflict, the medical profession was considerably confused in adjusting itself to definite antiseptic methods. Trench warfare was a new condition, heretofore not faced by any army. Besides the caring for the cleanliness of the trenches, the problems of wound infection became more serious, due to the extreme abundance of all sorts of organisms present in the richly fertilized soil, as well as in the air, which was always laden with dust, due to the continual heavy shell fire. Still a larger factor, perhaps, than the latter, was the occurrence of sepsis, due to the destruction and devitalization of tissue by fragments of the most

deadly, modern missiles. As the war progressed, experience, together with painstaking care, began to mold and develop systematic methods, which appear to give certain and satisfactory results.

It is my intent to present in this paper the important facts concerning the various chemicals and substances, that are to-day playing a big rôle as antiseptics in this war. It would be almost impossible to detail the approved methods of treatment by these substances, as the extended experience and knowledge, from the masses of cases treated, have evolved a system in which the wounds are differentiated and subdivided into groups. These in turn are placed in special wards and treated by men who are especially qualified to handle the particular class of wounds only.

The search for the ideal germicide began when Pasteur's ideas were put into practice by Lister and his collaborators. The latter applied the first principles in the prevention of infection. They cannot, however, be credited with the solving of the bigger problems that this war has brought forth, the mastering and conquering of infections that have already progressed to an alarming extent.

In surgery of the days preceding this war, the greater number of wounds were indeed simple, not infected, and primarily clean. The technique in treatment depended upon the use of soap, water, alcohol, phenol or cresol solutions, iodine, sterile dressings, and the upkeep of the patients' bacterial resistance. But the demands now made upon surgery by modern warfare necessitated a search for agents to treat infection, as the vast majority of the wounds in this war are grossly infected before coming into the hospital.

The newer antiseptics may be roughly divided into two classes: (1) those that depend upon chlorine for their bactericidal properties, (2) those included in the class of dye products, all of which are elaborate chemical compounds.

THE HYPOCHLORITES.—The bleaching and bactericidal properties of the hypochlorites may be traced back to 1788, when Berthollet obtained a disinfectant liquid by treating alkali with chlorine. In 1846, Semmelweiss aborted an epidemic of puerperal fever by the use of hypochlorite of calcium. From time to time, various investigators reported the active antiseptic properties of the different hypochlorite solutions. It has been found, however, that the latter are unstable and too caustic for medicinal as well as surgical use. It then remained for Dakin, Carrel and their associates to correct these reprehensible qualities and adopt them to the big rôle they are playing to-day.

EUPAD—SOLUTION OF EUSOL—AND HYPOCHLOROUS ACID.—While Dakin and Carrel were attempting to prepare a satisfactory hypochlorite antiseptic solution, Prof. J. L. Smith and his associates, of the University of Edinburgh, found that free hypochlorous acid was a more active antiseptic than its salts. Its bactericidal value was high and it also possessed the advantage of not coagulating albuminous matter. To effect a complete liberation of the hypochlorous acid, they first prepared a powder by intimately mixing equal parts of finely ground chlorinated lime and boric acid. This was named eupad.

Solution of eusol was made by mixing 25 Gms. of eupad with one liter of water, allowing the mixture to stand for 3 or 4 hours, then siphoning off the supernatant liquid and filtering the remainder, to rid it of the insoluble calcium borate. The filtrate, solution of eusol, contains some calcium chloride and about .5 per cent. of free hypochlorous acid, which corresponds to about .34 per cent. of available chlorine.

Still later, Drs. Beattie, Lewis, and Gee succeeded in preparing hypochlorous acid electrically from hypertonic saline solution. The apparatus used is ingenious and simple and can readily be fixed up in any hospital or laboratory. For further reference, the reader is referred to their original article in the *British Medical Journal* (Feb. 24, 1917, page 256).

DAKIN-CARREL SOLUTION.—Drs. Dakin and Carrel began their work in Prof. Triffier's laboratory, in Paris, in December, 1914, to overcome the problems that confronted the medical units in this war. They tested hundreds of chemicals before their hypochlorite solution was perfected in June, 1915, which was destined to become one of the most successful antiseptics ever put forth.

The formula, technique and mode of preparation of the solution have been published in the leading scientific journals and it would be useless to rewrite them here. However, I may mention that Dakin's original formula, containing boric acid, has been replaced by Dufrasne's modification, in which boric acid is excluded, and sodium bicarbonate, anhydrous sodium carbonate, chlorinated lime and water are the revised ingredients (this solution being known as Neutral Dakin-Carrel Solution). Though some laboratories market a concentrated hypochlorite solution and advise the dilution and neutralization of the alkalinity with boric acid before use, it is inadvisable to follow such procedure as some have reported rather

lamentable results when solutions containing boric acid have been used, and such action is claimed to be due to the sodium borate formed. The Dufrasne solution has also been found to be more bactericidal and less caustic than the original formula.

In preparing the solution, the two important facts essential to note are that the end product is to be absolutely free of alkali and the solution should not be used if the hypochlorite content is much below .45 per cent. or above .5 per cent. (which corresponds to about .22 per cent. available chlorine). This particular strength can be maintained with little variation for at least a month, a fact which in itself ought to discourage the use of modified formulas for extemporaneous preparation. I have kept a solution, that originally contained .487 per cent. sodium hypochlorite, for over 34 days before its strength registered below .45 per cent. The latter solution was kept in 4-ounce, 8-ounce, 1-pint and $\frac{1}{2}$ -gallon amber-colored bottles, both in the light and in a dark place, and the identical solution kept in green glass bottles, and placed in the dark, showed almost similar results.

Besides the two important facts noted, success or failure in treatment depends on the mode of procedure. It can be safely said that those who reported valueless results, when using this solution, employed a preparation that was faulty or they knew too little of how to put it to service in treating wounds; and it is due to its improper use by such individuals, that the idea was at times conveyed that Dakin's solution is a useless panacea. It is not a "cure for all" but very valuable in many cases, when each and every step is exactly and implicitly followed out, as directed by Dr. Carrel.

In the first place, all areas surrounding the wound should be cleaned with ether or benzene. After shaving the area encircling the wound, all dead tissue should be cut away. Be certain that all of the necrotic and devitalized tissue as well as all foreign matters are removed. After further cleansing with soap, the area is painted with iodine. Then with fresh sterile instruments, the wound is opened and exposed, preferably in basin-like cavities. All bleeding parts are carefully and cautiously controlled. Special care is to be noted that all blood clots are removed, as the hypochlorite solution dissolves blood clots, and subsequently severe secondary hemorrhage may set in. The final treatment before applying the solution is to place bandages, enmeshed with petrolatum along the edge of the wound so as to avoid irritation of the surrounding skin tissue.

In using the solution, after all preliminary work has been completed, care must be taken to obtain an even and not too strong flow of the fluid and also that the fluid flows away freely. If applied as a dressing, it must be changed frequently as its germicidal action, in contact with living tissue, lasts for about one hour only.

The mode of action of the hypochlorites has recently stirred up much discussion, with the outcome that few are supporting, at present, the theory that their antiseptic action is due to the oxygen formed by their decomposition. It appears that in the presence of organic matter, such as living tissue, bacterial products, etc., the hypochlorites liberate chlorine rather than oxygen. A portion of this *Cl* unites with *NH* groups of the proteins, converting them into *NCl* groups, products belonging to the chloramines. The latter possess the antiseptic properties and exert the bactericidal effect. In addition the chloramines formed seem to effect a rapid flow of lymph from the surface of the wound and thus inhibit toxic absorption.

CHLORAMIN-T.—Chloramin-T is a name proposed by Dr. Dakin and those associated with him for the synthetic germicide Tolueneparasulphondichloramin. It is non-irritating, non-toxic, considerably more stable than the Dakin-Carrel solution and corresponds to the chloramins described previously as forming between the chlorine of the hypochlorites and the proteins of the tissue. It asserts its antiseptic action as do the hypochlorites and accordingly before application, similar preliminary precautions as are to be heeded before applying the Dakin-Carrel solution, are to be enforced here.

Chloramin-T is soluble in water and thus a more concentrated solution than the Dakin-Carrel fluid can be made. However, in aqueous solutions, its antiseptic properties in the presence of living tissue seem to disappear in about two hours. To overcome this objection and to prolong its antiseptic action in a concentrated solution, so that this powerful germicide which contains about 25 per cent. available chlorine would be thus permitted to diffuse slowly and be more effective, from 5 per cent. to 10 per cent. solutions of chloramin-T in oil were made. The oil used is either chlorinated eucalyptol or equal parts of this and chlorinated paraffin oil. However, most of the units and medical practitioners prefer the use of chlorinated eucalyptol, solely, as the vehicle, and concentrations as high as 20 per cent. are used in some instances.

A solution of this chemical in chlorinated eucalyptol can be

kept for about a month before any noticeable loss is apparent, while with chlorinated paraffin oil as part of the formula, the permanence of the antiseptic is considerably shortened. The only reason for using the paraffin oil is to cheapen the cost of the end product.

Application of this germicide is made by spraying the wound with the oily solution and applying as a covering a few strips of gauze. The slow but persistent action of the oily antiseptic preparation necessitates a change of dressing only once a day, a property which will perhaps hasten the increase of its use as compared with Dakin's fluid.

Chloramin-T, chlorinated eucalyptol, and all of the other Dakin preparations are now manufactured and marketed in this country. The following formulas for preparing Chloramin-T, Chlorinated Eucalyptol, and Chlorinated Paraffin Oil were given by Dr. R. G. LeConte in an article read by him before the American Surgical Association, at Boston, June 2, 1917.

For the Preparation of Toluene-Parasulphondichloramin or Dichloramin-T (Chattaway's method).

Take—

Chlorinated Lime (good quality)	350 to 400 Gm.
Water	2 Liters
Chloroform	} about 100 mls of each
Acetic Acid	
Toluene-parasulphonamid	75 Gm.

Add the chlorinated lime to the water and shake for half an hour and allow the mixture to settle. Siphon off the supernatant liquid and filter the remainder. Dissolve the powdered toluene-parasulphonamid in the filtrate and filter if necessary. Place this mixture in a separatory funnel and gradually acidify with acetic acid. Add 100 mls of chloroform and extract the dichloramin. Remove the chloroform layer and allow the solution to evaporate spontaneously. Dry the residue in vacuo and powder.

For the Preparation of Chlorinated Eucalyptol.

Take—

Eucalyptol, U. S. P.	500 mls
Potassium Chlorate	15 Gm.
Hydrochloric Acid, U. S. P.	50 mls

Mix all three and allow them to interact for about 12 hours. Wash well with water either by decantation or in a separatory

funnel. Then wash with sodium carbonate solution. Add anhydrous sodium carbonate and allow this to remain there for 24 hours. Filter and dry over calcium chloride.

For the Preparation of Chlorinated Paraffin Oil.

Take—

Paraffin Oil	500 mls
Potassium Chlorate	15 Gm.
Hydrochloric Acid	50 mls

Expose the mixture to the light and then allow it to stand over night. Wash it in a separatory funnel successively with water, salt solution, and finally with water. Add a few pieces of calcium chloride and 5 Gm. of purified charcoal and filter with suction.

Doctors Dufrasne, Vincent and others, at present at the Allies' front, have been using a chloramin-T paste, both for maintaining asepsis of a wound and for sterilizing infected parts. The paste, which appears as a snow-white cream, is sufficiently active to be used effectively but begins to lose its activity in about a month after preparation.

The following is a formula of the paste used by Dr. Dufrasne and published in the July issue of the *Journal of Experimental Medicine*.

Chloramin-T Paste.

Chloramin-T	5 to 20 Gm. (or the desired quantity)	
Stearic Acid	80 Gm.	} or 86 Gm. Sodium Stearate
Sodium Hydroxide	q.s.	
Water	1 Liter	

To one liter of boiled water, add the stearic acid. When the latter has melted, add enough caustic soda to saponify all of the fatty acid. After complete solution, add the chloramin-T to give a product of the desired strength. Shake and finally stir the mixture until it has congealed.

CHLORAZENE.—Another Dakin product is similar to dichloramin-T, being the sodium salt of para-toluenesulphochloramin. In some of the hospitals, the two antiseptics have been used in conjunction, first spraying and thoroughly cleansing the wound with an aqueous solution of chlorazene and then applying the oily solution or paste of dichloramin.

HALAZONE.—Another problem which the war brought forth was

the sterilization of the water supplies in the field. Dr. Dakin, in coöperation with Major E. K. Dunham, U. S. Army Medical Service, announced recently a new chlorine derivative for the sterilization and purification of polluted, contaminated or suspicious water.

This synthetic, chemically known as para-sulphondichloraminbenzoic acid, is the most stable of the recently discovered chlorine preparations and derivatives. It is marketed in tablet form under the name of halazone. Each tablet contains one sixteenth of a grain of the chemical and is sufficient to disinfect and render potable one quart of the most polluted sample of water in from five to thirty minutes, without leaving the resultant sterilized product unpleasant to the taste.

If one attempt an actual study of the working conditions in the medical units, there will be revealed a real lack of systematic and organized method of continuity in treatment. Such a state of affairs has been brought to notice by many of the profession, who are at present in this country for other service or for recuperation. A patient at the company hospital may receive a Wright salt pack or a Bipp dressing—at the field hospital, eusol, hypochlorous acid or dichloramin-T may be used in the treatment. Should he be transferred to the base hospital, he will be treated with Dakin-Carrel solution, while on the inland, flavine, brilliant green or green spray may perhaps be used to effect antiseptis.

It is due to this lack of coöperation and also perhaps to the effects of personal opinion and attempts to discover specific antiseptics that we are compelled to familiarize ourselves with all of these products now in use, until the future will decide the recognition of the best antiseptics and methods of treatment.

FLAVINE AND SIMILAR DYES.—Although the foregoing antiseptics of the chlorine series have been only recently discovered, they are nevertheless already extensively used in this country. This is, however, not the case with the antiseptics of the flavine group. The latter are not readily obtainable in this country and as yet are only manufactured by two or three firms in England. This is due to the fact that the compounds are elaborate synthetics and much experimentation was necessary before a product equal to that supplied by the German manufacturing plants could be marketed.

The members of the flavine series were investigated in the latter part of the year 1916 by a number of workers in the Middlesex Hospital in England (their original work was published in the

British Medical Journal, Jan. 20, 1917). Since then numerous other observations have been made with the flavine compounds and the investigations have proven most valuable. For technical reasons, the substance first experimented with under the name of "Flavine," has been termed "Acriflavine." This was to avoid confusion with an existing commercial vegetable dye "Flavine," and the German registered and trade marked product "Trypaflavine," an antiseptic originally made for and used by Dr. Ehrlich. Quite recently, a new member has been added to the series under the name of "Pro-flavine." The latter is at present being manufactured in England on a large scale, as it is easier to produce than "Acriflavine," and likewise more active.

Chemically the flavines are members of the acridine group, the first product being the chloride of diamino methyl acridinum. They are stable, non-toxic, non-irritating and water soluble, being used as a dressing in dilutions of 1:1000 or 1:2000, depending upon the treatment, while in few instances the dry product itself has been employed. Clinical experiences have shown that this series of antiseptics exert a slowly progressive bactericidal action, and that these compounds are enhanced in their potency by the presence of serum almost to tenfold, a feature which promises to bring them into more extensive usage, for it is a known fact that the antiseptic and bactericidal properties of substances commonly used are diminished when in contact with serum. In addition, the flavines are also less harmful to the tissues and do not interfere with the natural defensive mechanism. This latter property enables the effective usage of higher concentrations than ordinarily are employed with other substances.

BRILLIANT GREEN—MALACHITE GREEN.—Two other dye products which have been extensively exploited and used in this war are brilliant green and malachite green.

Brilliant green has been employed in a 1:1000 dilution, either with water or physiological salt solution. The latter solution has been used both as a lotion or, when soaked up in gauze, as a dressing in practically all kinds of wounds and on all kinds of tissue. Although differing from flavine, by losing part of its bactericidal properties in serum, it is nevertheless potent, non-irritating and devoid of general toxic action. Some have used it as a flush in conjunction with Wright's salt pack treatment or with the Dakin-Carrel method, claiming that the results are better than the use of

either alone. It has also been used effectively as an irrigation in burns before the application of the paraffin treatment.

Malachite green, in conjunction with bichloride of mercury, has been recently used in "Green Spray." This is made of equal parts of 2 per cent. malachite green, dissolved in 80 per cent. ethyl alcohol and 2 per cent. bichloride of mercury, dissolved in 80 per cent. ethyl alcohol. The solutions are mixed before use, and form a chemical compound, known as "Micklethwait." The latter, when in contact with the tissues, is dissociated, forming probably an albuminate of each. The malachite albuminate is readily reduced when in contact with living tissue and is thus capable of exerting its antiseptic action, while the albuminate of mercury is only gradually absorbed, exerting its action rather slowly.

The "Green Spray" has also been extensively used, with success, as an antiseptic spray or dressing before operations, replacing iodine. When used, it stains the applied area green.

In addition to the antiseptics described here, as being the ones most widely used before and after infection has set in, we must not forget the fact that the antiseptics and methods of treatment, in use before the war, are still in use and practiced to-day by many at the front. Many of the minor infections are treated with normal salt solution or hypertonic saline instead of Dakin-Carrel or other solutions. Wright's method of introducing and packing the wound with saline tablets is still used by others. However, it may be emphasized that such treatment has not proven efficacious in the many severe wounds contracted in the war.

Many of the regimental hospitals introduce various mixtures into fresh wounds, so as to allow them to diffuse and inhibit bacterial growth, until thorough disinfection can be applied later. One of these combinations is a powder, called "Borral," which is a mixture of boric and salicylic acids. Another is a cresol paste, made by incorporating 20 per cent. of cresol in a mixture of lanolin and wax. Others use the "Bipp Paste," this sometimes being the sole treatment. The latter consists of one part by weight of bismuth subnitrate, two parts by weight of iodoform and sufficient wax to make a thick paste.

Besides these, the widely used peroxide of hydrogen, tincture of iodine, bichloride of mercury, and others are still extensively used under certain conditions, while the coal tar derivatives, such as the cresols and phenols, are most widely employed in assisting as deodorants and bactericides, in the disposal of excreta in the trenches.

THE DAKIN OR CARREL-DAKIN SOLUTION.

BY IVOR GRIFFITH, P.D.

Sodium hypochlorite, which is the chemical to which the antiseptic irrigating solution, known as the Dakin or Carrel-Dakin solution, owes its activity, was discovered by Berthollet, at the end of the eighteenth century. Labarraque, another French chemist, won considerable renown, when he successfully used a solution of this chemical to embalm and deodorize the body of Louis the XVIII, after it had been allowed to partially decay. The solution which he used and which afterwards bore his name is still used for a variety of technical purposes, chiefly as a bleach and disinfectant. At the commencement of hostilities in Europe, scientists and surgeons turned to it and other chlorine compounds with the hope of finding among them the "philosopher's stone" of modern surgery, or in other words, the perfect germicide, search for which has been carried on ever since the dawn of the new era which Lister and Pasteur inaugurated. Dr. LeConte very simply defines this "perfect surgical germicide," in this sentence. "It must kill all parasitic life while causing no harm to any cell of the living body."

The proposition of finding such a germicide presented itself in a most convincing manner to the surgeons of Europe when the endless array of mutilated and mangled soldiers poured into the field and base hospitals of northern France, with virulently infected wounds of such a character that demanded treatment distinctly different from that resorted to in civil surgery. Experimentation with Labarraque's and similar chlorine combinations soon established the fact that such compounds could not be safely used in surgery. They proved to be destructive to the tissue by reason of their high alkali content and irritating on account of their high chlorine content.

Continued study and experimentation, however, resulted in the introduction of what is now referred to as Dakin's original solution. H. D. Dakin, a chemist on the staff of the Herter laboratory, New York, who was in France with the Rockefeller research institute, developed a solution which with a little modification has partially solved the problem of prevention and control of bacterial infection in surgical practice. Dr. Alexis Carrel, also of the Rockefeller Institute, evolved a method of continuous irrigation of wounds by means of Dakin solution, which has proven to be of tremendous significance. The original Dakin solution involved the use of boric

acid in its preparation. This preparation was found objectionable however, due to its irritating qualities which were later attributed to the boric acid. It was Daufresne, a French scientist, who suggested the modification whereby the boric acid was advantageously replaced by sodium bicarbonate. It is the Daufresne modification of the original Dakin formula that is used now in the preparation of Dakin or Carrel-Dakin solution.

While much has been printed in the various journals concerning the history, preparation and standardization of this solution, it is to be regretted that, in several instances, the matter has been presented in a complicated form, much important data being left to the imagination of the reader and in other instances errors seem to have crept into the text. It is, therefore, with the intention of simplifying the text and explaining certain obscure points that this article is presented. It is an attempt to outline the proposition in straight lines instead of hyperbolas.

The Carrel-Dakin solution is essentially a solution of sodium hypochlorite which must be free from caustic alkali. It must contain between 0.45 per cent. and 0.50 per cent. of sodium hypochlorite (not available chlorine as stated in some of the published papers on the subject, and upon which the assay process of the U. S. P. IX for *Liquor Sodæ Chlorinatæ* is based).

Another error noticed is the assumption that the chlorinated lime on the market contains 25 per cent. chlorine, while as a matter of fact the *Pharmacopœia* specifies that chlorinated lime shall contain "not less than 30 per cent. of available chlorine." In the writer's judgment it would seem more logical to write the general formula assuming that the lime is nearer to 30 per cent. strength than to 25 per cent. A grocery store sample recently examined showed over 35 per cent.

Reverting to the content of hypochlorite in this solution it might be well to state here that under 0.45 per cent. the solution is not active enough and above 0.50 per cent. it is irritant.

Using chlorinated lime of 30 per cent. chlorine content the following formula is used to prepare ten liters of solution,—

Chlorinated lime	154 Gm.
* Sodium carbonate dried	77 Gm.
Sodium bicarbonate	64 Gm.

* If the monohydrated sodium carbonate is used take 90.5 Gm. or if the crystal sodium carbonate is used take 200 Gm.

Pour into a 12-liter bottle the chlorinated lime and five liters of water, shake vigorously for a few minutes and allow the mixture to stand for twelve hours, shaking at frequent intervals. Dissolve the sodium salts in five liters of water and after the maceration of the chlorinated lime is completed pour the solution of the sodium salts into the other mixture and mix thoroughly. Allow the mixture to stand for at least a half hour until the reaction is complete and the calcium carbonate has subsided. Siphon off the supernatant liquid and filter through white filter paper. The solution is then ready for use.

TITRATION OF THE CHLORINATED LIME.—Because of the variation of this product as now obtained on the market, it is necessary to determine the amount of active chlorine contained in the chlorinated lime which is to be used. This is done in order to use an exact calculated quantity according to its concentration. The assay is carried on in the following manner:

Take from different parts of the container a small quantity of the chlorinated lime so as to have exactly 20 Gm. of a representative sample; mix it as thoroughly as possible in a liter of water and allow the mixture to stand for a few hours.

Measure 10 mls of the clear supernatant liquid and add 20 mls of a 10 per cent. solution of potassium iodide and 2 mls of acetic or hydrochloric acid, then carefully titrate with $\frac{N}{10}$ sodium thiosulphate solution, decoloration of course denoting the end reaction. The number of mls of the $\frac{N}{10}$ sodium thiosulphate solution used multiplied by 1.775 will give the weight of active or available chlorine contained in 100 Gm. of the chlorinated lime; in other words the percentage of chlorine.

This assay must be made every time the solution is being prepared. When the result obtained differs from 30 per cent., it will be necessary to increase or reduce the proportion of the three ingredients in the formula. This can be easily done by multiplying each of the three numbers 154, 77 and 64 by the factor $30/X$ in which X is the per cent. of active chlorine in the chlorinated lime used.

ASSAY OF THE FINISHED SOLUTION.—It is the correct policy to assay the finished product as well and this is done in the following way:

To ten mls of the finished solution add 20 mls of 10 per cent. solution of potassium iodide and 2 mls of acetic or hydrochloric acid. Titrate with $\frac{N}{10}$ sodium thiosulphate solution until decolora-

tion is complete. The number of mls used multiplied by 0.03725 will be the weight of sodium hypochlorite in 100 mls of the solution; in other words the percentage, weight in volume, of sodium hypochlorite.

To determine absence of free caustic alkali in the finished solution sprinkle on the surface of 20 mls of the solution about 0.2 Gm. of phenolphthalein. No red coloration should appear.

In the preparation of the solution only the highest grade of chemicals should be used. It is a matter of record that nearly all of the unfavorable reports concerning the value of this method of wound sterilization were undoubtedly due to the use of impure chemicals or else negligence in the preparation of the solution. It has been the writer's experience that it more than pays to use the purest procurable ingredients in the manufacture of this exceedingly useful addition to the surgeon's armamentaria.

Concerning the stability or permanence of this solution it has been proven that when kept in a cool, dark place it deteriorates very slowly. A solution, assaying 0.49 per cent. sodium hypochlorite on the day of its preparation, at the end of three months' storage in a well-stoppered bottle kept in a cool, dark place, showed a content of 0.47 per cent. sodium hypochlorite. The same solution, kept two months longer under the same conditions, assayed slightly less than 0.44 per cent., or one degree under its specified strength.

Despite this fact it is always policy to dispense only a recently prepared solution and this is customary in the larger institutions, where the preparation and standardization of this solution has become part of the day's routine work.

AN IMPROVED APPARATUS FOR APPLYING CARREL- DAKIN SOLUTION OR HYPERTONIC SALT SOLU- TION ACCORDING TO THE METHOD OF WRIGHT, TANNER AND MATSON.¹

BY PAUL S. PITTENGER, PHAR.D.

In order to make proper use of the Carrel-Dakin solution or hypertonic salt solution for the disinfection of wounds, it is necessary to have a suitable form of apparatus for holding the solution

¹ *The Lancet*, November 11, 1916.

and conveying it in desired quantities at the proper temperature to the wounds requiring treatment.

Several forms of apparatus have been devised for this purpose, but to the minds of many they do not fulfill the requirements demanded in successfully carrying out the above methods of wound sterilization. I have, therefore, devised an apparatus which, although simple in its construction, overcomes the objections that have been raised to various appliances now obtainable.

The apparatus is described in detail further on in this paper, but at this stage I wish to call attention to the following advantages which it possesses over other forms on the market.

SOME ADVANTAGES OF THE IMPROVED APPARATUS.—A caloris bottle is used as the reservoir for the solutions, and thus the temperature at which they are supplied to the instillation tubes may be controlled, thus making it possible to use the apparatus for administering Dakin's solution or for irrigating wounds with saline solution at a constant temperature. It also makes it possible to use the

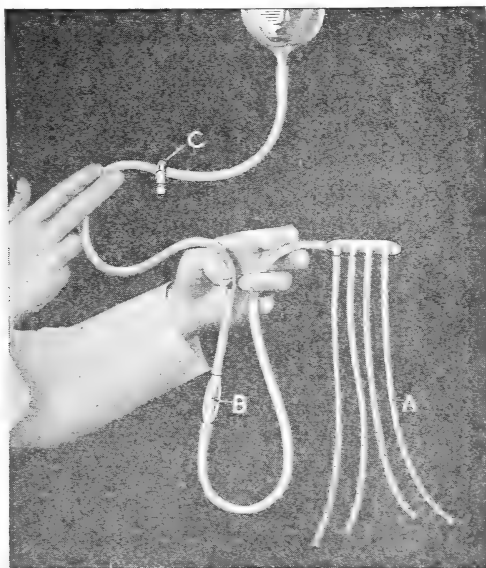


FIG. 1. Instillation apparatus supplied with but *one* sight feed and *one* clamp. This style apparatus is unsatisfactory because it does not distribute the solution uniformly to the instillation tubes. *A*, rubber instillation tubes with ends tied, attached to four-way glass distributing tube; *B*, glass sight feed; *C*, adjustable clamp for controlling flow.

apparatus for hypodermoclysis or Murphy drip when not needed for wound sterilization. The collapsible stand from which the calorix bottle is suspended can be quickly attached to a bed-post of any size. The rate of flow of the solution to each instillation tube is under absolute control, being regulated from the distributing tube to the instillation tubes by means of *individual* clamps which are attached to *each* tube.

By means of the glass sight-feeds the attendant or *patient* can see at a glance whether the solution is being delivered properly to each tube. The instillation tubes employed have rounded ends so that they may be passed into deeply penetrating or "through-and-through" wounds without great pain to the patient. Several wounds can be treated from this apparatus at one time because of the superior method of distribution. No support for the apparatus is needed at the site of instillation, thus saving the patient much discomfort.

DISADVANTAGES IN THE USE OF SOME FORMS OF APPARATUS NOW ON THE MARKET.²—Before devising this apparatus no appliance could be found on the market by which it was possible to supply uniformly the solution to two or more different parts of the body from one container. Nor was there any satisfactory mechanical device available for attaching the container of the solution to bed-posts of any size without building a framework of some kind or a support at the site of injection. Furthermore, none of the appliances on the market offered a satisfactory method of controlling the flow of solution so as to insure uniform distribution to each instillation tube.

The two principal forms of apparatus found in use were those illustrated in Figs. 1 and 3. The apparatus shown in Fig. 1 is supplied with but one sight-feed and one clamp and is very unreliable because it does not permit uniform distribution of the solution to the instillation tubes. In other words, when the solution is dropping in the sight-feed at the usual rate, practically all of the solution is carried by the first instillation tube and very little ever reaches the other three tubes. It is therefore necessary to flush the apparatus at intervals in order that some of the solution may be carried by all four tubes, and even then it is impossible to obtain an even distribu-

² "Simplification of the Carrel-Dakin Method of Wound Sterilization in Military and Civil Practice," by Albee & Pittenger, *American Medicine*, May, 1917.

tion. Experiments show that when the clamp is opened all the way and the solution is running full force, the third and fourth instillation tubes receive very little if any of the liquid, as practically the entire flow from the distributing tube is carried by the first and second tubes. (See Fig. 2.)

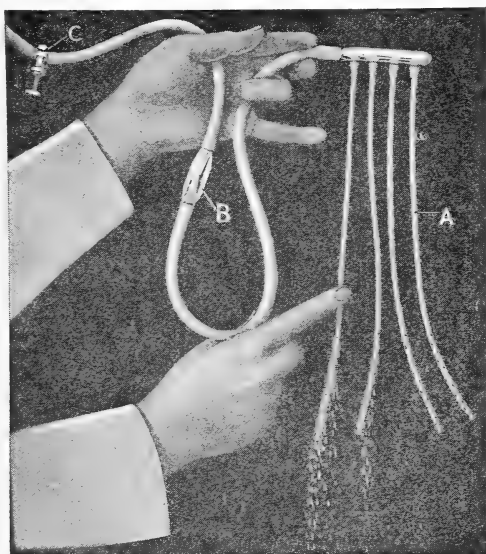


FIG. 2. Shows *uneven distribution* of solution by this style apparatus. Practically all of solution is carried by first instillation tube, very little by the second and only an occasional drop by the third and fourth.

While this form of apparatus would be satisfactory for instilling large shrapnel wounds, it offers the further objection that its short instillation tubes attached to the four parallel outlets of the distributing tube must all be directed to the same site of irrigation and cannot be inserted into the wound from different sides and at different angles.

Some operators have gone so far as to employ with this apparatus a glass distributing tube having as many as eight outlets connecting with eight instillation tubes, even though experiments prove conclusively that practically all of the solution would be carried by the first two tubes unless it is supplied at so great a rate as to cause flooding of the bed. It is the purpose of the Carrel method of wound disinfection to supply only enough solution to keep the inner dressings moist.

In the Rose irrigator shown in Fig. 3, a piece of gauze bandage is inserted into each of the four connecting tubes and the ends of the gauze extend into the large glass sight-feed above. The solu-

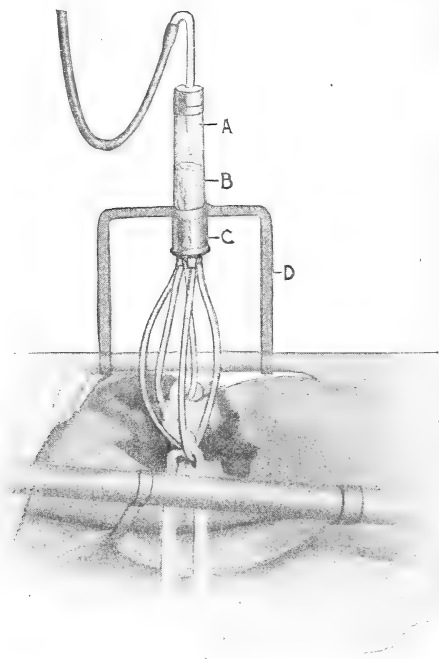


FIG. 3. Rose-irrigator. *A*, drop counter; *B*, gauze filter; *C*, perforated rubber stopper. Pieces of gauze bandage extend from *B*, through the perforations in *C* and into each of the instillation tubes. The solution drops on the upper ends of the bandage in *B* and is carried by capillarity into the instillation tubes.

tion falls on the gauze from the dropper *A* and is carried into the four instillation tubes by capillarity. There is no way of determining, however, whether or not the four tubes are carrying the solution as desired as the tubes are made of rubber. In case it is desired that only one or two instillation tubes from this apparatus or the one shown in Fig. 2 are to be used, it is necessary to clamp the remaining tubes at the wound thus causing more or less interference when dressing the wound, whereas in the improved apparatus the supply of solution for each instillation tube is independent of all others, and the clamping is done at the upper end of the apparatus.

There will therefore never be more instillation tubes at the site of the wound than are required for irrigation. Another objection to the Rose irrigator is found in the fact that the glass reservoir from which the solution is distributed to the various instillation tubes must be held in a vertical position by some form of support at the site of the wound. If, for example, a patient should happen to have two wounds in the same leg, one above the knee and the other

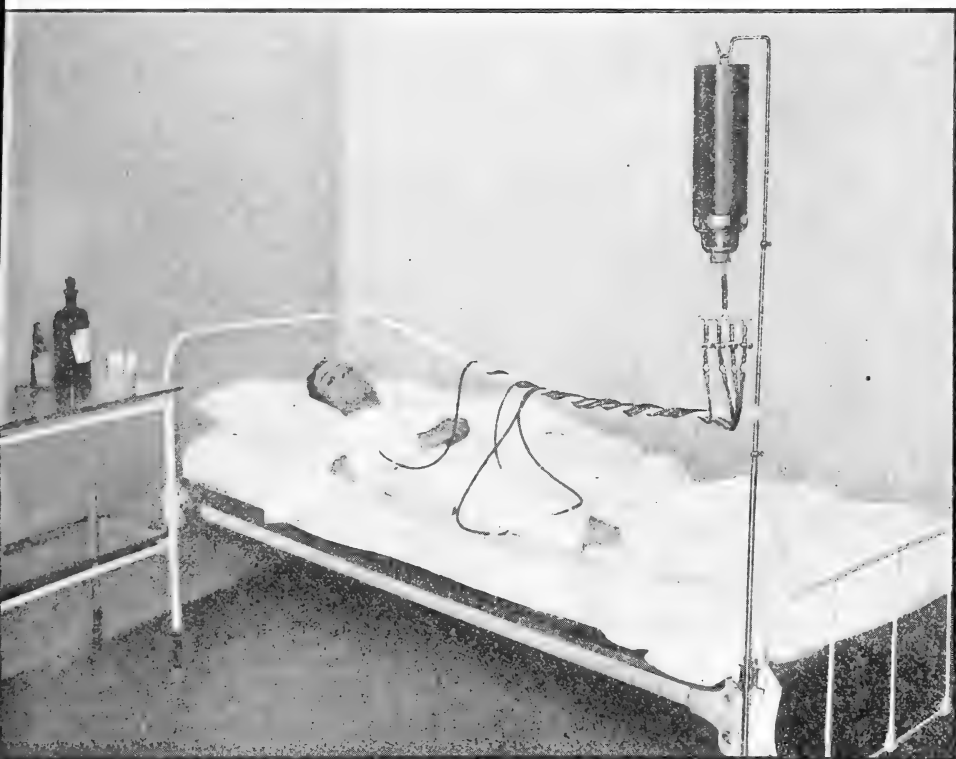


FIG. 4-A. Improved apparatus in use. Note that the instillation tubes may be freely manipulated while dressing the wounds without interference from the distributing tubes, sight-feed bulbs or clamps, all of which are well elevated above the patient.

below the knee, it would be necessary to employ one complete apparatus for irrigating each wound. The disadvantages with regard to lack of simple attachment, insertion of instillation tubes, etc., discussed in describing the apparatus pictured in Fig. 2, apply also to the Rose irrigator.

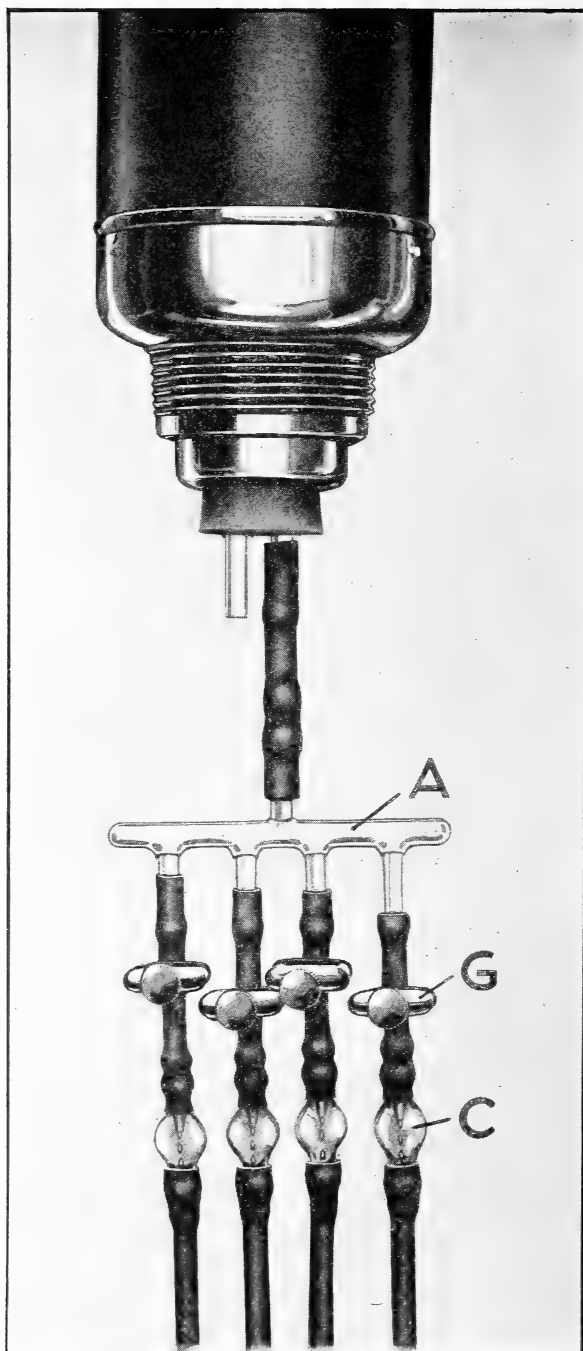


FIG. 4-B. Shows arrangement of distributing tube (*a*), individual sight-feed bulbs (*c*) and clamps (*g*). Note that rate of flow can be observed and controlled in each individual tube.

DETAILED DESCRIPTION OF IMPROVED APPARATUS.—As stated before this apparatus was designed to overcome all of the limitations referred to above, and the following illustrations and descriptions will bear out the claims for its superiority over existing devices.

Figure 4A shows the apparatus at the bedside in actual use. The collapsible stand shown in detail in Fig. 6 can be attached to a bedpost of any size and is provided with a hook at its top from which the caloriz bottle, (*e*) Fig. 6, is suspended by means of the hinged eye (*e*¹) which is riveted to the base of the bottle. The object of using a caloriz bottle as a reservoir is to enable supplying the solution at a body temperature and to permit of using this apparatus for hypodermoclysis, Murphy drip, or for irrigating wounds with hypertonic salt solution.

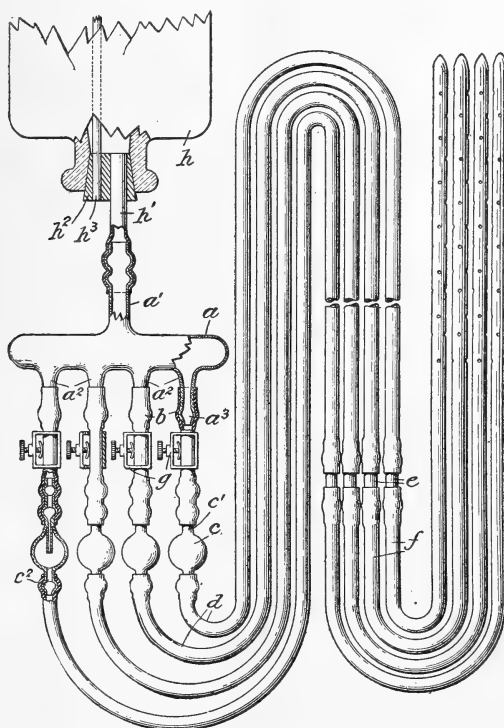


FIG. 5. Graphic illustration of improved instillation apparatus. Each connecting tube is supplied with an *individual clamp and sight-feed* which makes it possible to accurately regulate the flow to *each* instillation tube. See text.

Fig. 5 shows the essential features of the apparatus, consisting of the glass distributing tube (*a*) to the upper end of which is sealed the short tube (*a*¹), used for connecting the caloris bottle (*h*) with the distributing tube by means of the pipe (*h*¹) which passes through the stopper of the bottle. A glass tube (*h*³) used as an air inlet also passes through the stopper and extends to the bottom of the caloris bottle. A number of tubes (*a*²) are blown into the lower section of (*a*) and although four of these tubes are shown in the illustration it is possible to vary this number according to the number of instillation tubes that may be required. The lower ends of the tubes (*a*²) are suitably enlarged so that rubber tubing (*b*) can readily be slipped on, thus serving as connections between the distributing tubes (*a*) and the glass sight-feed bulbs (*c*). By means of these sight-feed bulbs (*c*) the rate of flow of the solution into the instillation tubes can be readily observed. The short extensions (*c*¹ and *c*²) on the sight-feed bulbs readily permit connection with the tubes (*b*) and (*d*). The connecting tubes (*d*) are readily attached to the instillation tubes (*f*) by means of short glass pipes (*e*) which have enlarged sections to insure snug union.

The rate of flow of the solution from the reservoir to the instillation tubes as observed through the sight-feed bulbs is adjusted by means of the screw clamps (*g*).

When the apparatus has been adjusted and is ready for use the solution is poured into the caloris bottle, which is then corked and suspended from the properly elevated stand, thus insuring a free gravity flow. The liquid passes from the reservoir into the distributing tube (*a*) and from there into the individual tubes (*a*²) which connect as previously described with the instillation tubes (*f*).

The surgeon, knowing the particular requirements of each wound or portion thereof, can adjust the rate of flow of the solution from each instillation tube independently of the others by means of the screw clamps (*g*), making his observations at the sight-feed bulbs (*c*).

By attaching the distributing tube (*a*), clamps (*g*) and sight-feed bulbs (*c*) near the outlet of the caloris bottle the only appreciable temperature change in the solution would occur in the connecting tubes (*d*) between the clamps (*g*) and the point of instillation, as the flow of the liquid from the clamp to the wound is continuous and free. Therefore, the loss in temperature under ordinary conditions between these two points can be readily determined.

Experiments have shown that in order to instill the solution at body temperature it should be warmed to 75° to 85° C. before being placed in the calorix bottle.

When used for hypertonic salt solution, hypodermoclysis or Murphy drip this apparatus is superior to other appliances in that it offers no difficulty whatever for furnishing the liquid for irrigation at any desired temperature. The connecting tubes are made of special thick-walled rubber tubing having a very fine bore, thus causing a minimum loss in temperature in the solution as it travels from the reservoir to the site of irrigation.

ADVANTAGES OF NEW FORM OF INSTILLATION TUBES.—It has been found that the usual style instillation tube with one end closed by tying as shown in Fig. 1 is unsatisfactory and often rather difficult to insert. Instillation tubes in which the ends are closed by rounded glass or hard rubber plugs are also undesirable because the plugs sometimes become detached when the tubes are withdrawn and remain in the wound as foreign bodies. It is advisable therefore to use instillation tubes of the style shown in Fig. 5 (f) which have a rounded closed end such as is found on the ordinary catheter. The large hole of the catheter is, of course, replaced by a series of very small lateral holes extending over about half the length of the tube. Instillation tubes of this type can readily be inserted into any wound with a minimum of pain and they also eliminate the possibility of any foreign bodies being left in the wound when they are withdrawn.

The fact that these instillation tubes are supplied with the solution from individual connecting tubes in which the flow can be accurately adjusted, makes it possible to insert them from any angle into wounds located in different parts of the body. Furthermore, their use permits treating at the same time, with one apparatus, wounds on upper and lower surfaces of the body no matter whether they are in a parallel or perpendicular position to these surfaces. The instillation tubes in other forms of apparatus cannot be placed in more than one position without causing the formation of kinks in the tubes and otherwise interfering with the proper supply of the solution.

The two-way circular tubes sometimes sutured to the edges of superficial wounds for the purpose of supplying the solution to all portions of them do not always answer the purpose, because the surface is usually not flat. One section of the tube is therefore on a

somewhat higher plane than the other end and the solution naturally runs to the lower level, thus being carried away from the wound rather than being evenly distributed over the entire surface. With

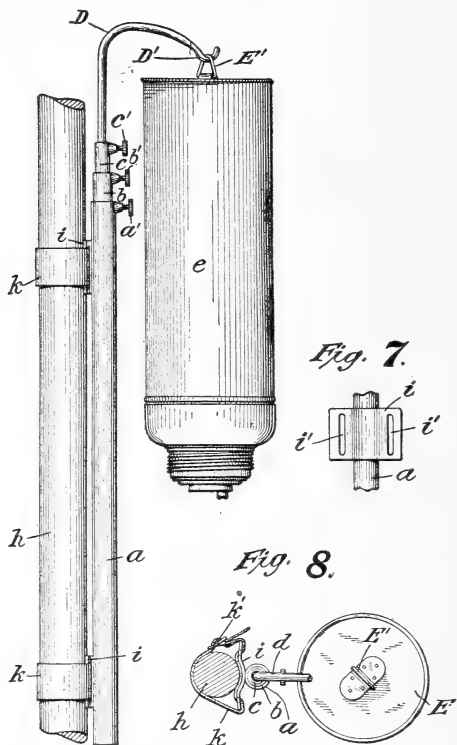


FIG. 6. Telescoping portable stand for supporting calorix bottle containing irrigating solution which can be attached to any size bed-post without danger of marring same. See text.

FIG. 7. Illustrates construction of metal lugs *i* containing slots *i'* through which the straps *k* pass and fasten stand to bed-post.

FIG. 8. Shows the relative position of stand *a, b, c, d*, metal lug *i*, strap *k*, and bed-post *h*.

the improved apparatus it is possible to fasten one instillation tube along the upper edge of the wound and another along the lower edge, and as each instillation tube is attached to an individual connecting tube which receives its supply of solution independently of the others, uniform distribution to all parts of the wound is possible.

In order to avoid the necessity of erecting a wooden framework over the bed of the patient as a means of support which is necessary when using other forms of apparatus, a small, strong, portable, collapsible stand has been devised which can readily be attached to bed-posts of any size by means of the device indicated in Fig. 6 (*k*) without danger of disfiguring the bed-post.

As will be noted from Fig. 6 the calorix bottle may be raised or lowered independently of the clamps which engage the bed-posts by means of the thumb screws (*a*¹) (*b*¹) (*c*¹). It can also be seen in this figure that the outermost tubular section (*a*) of the support has attached near its ends two metal strap lugs (*i*) which in cross section conform generally to the contour of the bed-posts and are provided near their edges with vertical slots (*i*¹), Fig. 7, through which the straps (*k*) made of webb belting are passed before being wound about the bed-post (*h*), Fig. 8, and fastened by means of the buckle (*k*¹).

SUPPLYING SOLUTION DIRECTLY TO WOUNDS.—After the collapsible stand has been attached to the bed-post and the apparatus has been adjusted for use a gauze bandage is stretched from the middle of the stand to the opposite end of the bed. This acts as a support for the connecting tubes. (See Fig. 4A.) The tubes are coiled around the bandage to points directly over the wounds to be supplied with the solution. From these points the connecting tubes descend vertically to the instillation tubes. This simple device entirely eliminates the necessity for building a wooden framework over the bed as is required with many of the other appliances and permits the adjustment of the instillation tubes to any angle or location as referred to above.

If the splendid results obtained by Carrel are to be repeated by others, the technic must be vigorously carried out and the solution used must be very carefully prepared. It has been estimated that the "Dakin" solution represents but twenty per cent. of the cure and the technic of Carrel represents eighty per cent. It is believed that the apparatus herein described will aid very materially the beginner in the technic of wound sterilization.

A REPORT OF THE RESULTS OF THE USE OF THE
CARREL-DAKIN SOLUTION ON MOUTH SURGERY.¹

BY H. M. BECK, D.D.S.

The use of the Carrel-Dakin solution as a germicide and mouth disinfectant was first suggested to the author of this article by Dr. A. T. McClintock, a bacteriologist. Dr. McClintock stated that he had used Dakin's solution in the mouth in several cases, with most gratifying results. This suggestion led to an investigation, and finally to the adoption of the solution in all of our surgical cases, to the exclusion of all other drugs, including iodine. Iodine has been considered a panacea for all mouth diseases and infections for years, and it is only recently that investigation has proved that iodine, therapeutically or bacteriologically, is anything but an ideal agent. The use of the drug has been continued only because we knew of nothing more efficient and less dangerous to take its place. Chemical sterilization of a wound or lesion can only be carried out with a strong germicide which is a non-toxic and non-irritating antiseptic. Less than 7 per cent. iodine is too weak antiseptically, and 7 per cent. or more is too irritating and toxic to be used on the delicate mucous membranes.

What is true of iodine is also true of mercury bichloride and the carbolic group. It is a common practice of our profession to disinfect an area by scrubbing it with iodine just before injecting novocaine-suprarenin. The soreness, irritation, swelling, and pain which often follow are always attributed to the novocaine. Careful observation of the action of novocaine-suprarenin for three years justifies the statement that the novocaine is not the offending cause, and examination of the part will show irritated, inflamed, sloughing mucous membrane such as could only be caused by an iodine burn.

Dakin's solution is so much more efficient, less irritating, and less toxic than any antiseptic we ever used that we feel justified in publishing the results of our investigations, with the hope that others will try it intelligently and scientifically, and report the results of their investigations.

USE OF THE SOLUTION IN PYORRHEA.—One of the diagnostic signs of pyorrhea is inflamed, bleeding gums about the necks of the

¹ Abstract of article in *The Dental Cosmos*, October, 1917.

teeth. Often the inflammation is so marked and the bleeding so excessive that thorough prophylactic treatment is almost impossible. To overcome this condition, have the patient rinse the mouth every four hours with Dakin's solution for two days before presenting himself for the prophylactic treatment. The operator will find, after two days' treatment with Dakin's solution, that most of the inflammation and bleeding has subsided, and that the heretofore painful scaling and polishing of the teeth can be effected with little or no pain. After the prophylactic treatment use the solution in a glass syringe with a platinum needle. If the solution reaches the point of infection without being diluted with saliva the flow of pus will stop in a few hours. If the pus persists, the solution has not reached the seat of infection and the treatment should be continued. In extreme cases of pyorrhea where very large and deep pockets are found we have used the following treatment with most gratifying results: First, the pocket and surrounding tissue is walled off with cotton rolls and kept as dry as possible. Then a small pellet of cotton is saturated with Dakin's solution and inserted into the pocket, packing it about the neck of the tooth and well down into the pocket. Caution: The packing should not be tight. This dressing should be changed every four hours for two days, and usually the flow of pus will cease in two or three treatments. If the flow of pus stops, the cotton dressing should be omitted but the pocket should be flushed out with the solution for three or four days. In several bad cases where it seemed impossible to reach the point of infection with Dakin's solution, we have inserted a fine wire into the pocket, made a radiograph to ascertain the location and depth of the pocket, and with this help have succeeded in getting Dakin's solution to the seat of infection and have been able to arrest the flow of pus.

TREATMENT FOLLOWING ROOT AMPUTATION.—Spray the wound every two hours with Dakin's solution. Use no other drug or treatment, and the result will be all that could be desired. Caution: Do not use more than 10 lb. pressure in the atomizer; a spray forced into a wound of inflamed tissue with 25 lb. or 30 lb. pressure is most injurious.

METHOD OF DISINFECTING THE MUCOUS MEMBRANE BEFORE HYPODERMIC INJECTIONS OF NOVOCAINE-SUPRARENIN.—In conductive anesthesia or in local injections, spray the mouth first with Dakin's solution, and after a few minutes wipe off the mucous membrane with 70 per cent. alcohol about the area where the needle is

to be inserted. Just before injection, again wipe the point of insertion with Dakin's solution. Caution: Do not scrub the part to be disinfected with Dakin's solution—simply wipe it off; and do not use Dakin's solution immediately before or after using iodine, menthol, benzol, or any of the numerous iodine preparations.

Before using the solution in the mouth we would advise those who are interested in the Carrel-Dakin method of wound sterilization to read the splendid paper by Dr. W. O'Neil Sherman, published in the March, 1917, issue of *Surgery, Gynecology, and Obstetrics*, also in the *Pennsylvania Medical Journal* for June, 1917. On July 31st the writer had the privilege of meeting Dr. Sherman and discussing a paper written by him and read before the Schuylkill County Medical Society at Buckwood Inn. We were very much impressed with Dr. Sherman's paper and with the very great stress he laid upon the necessity of using the Daufresne technique in preparing the solution, of always using a fresh solution, and of following the technique of Dr. Carrel *verbatim* in using the Carrel-Dakin solution in the treatment of wounds.

PHARMACEUTICAL SERVICE IN THE FRENCH ARMY.¹

BY GEORGE M. BERINGER, A.M., PH.M.

The establishment of a properly organized and well equipped pharmaceutical corps as a branch of the Medical Department of the United States army is urged as a national necessity by those who are acquainted with the unscientific methods under which potent drugs are controlled and the dispensing of medicines is carried on in our army. In this respect, we can profit by learning the experiences and studying the methods of the foreign armies, those of our allies and the enemy alike, for supplying the medical needs and providing for the hygienic care of their soldiers.

In anticipation of the necessities of war, both Germany and France, in recent years, again reorganized their respective army pharmaceutical services and greatly extended the duties assigned to the pharmaceutical corps. Not only are these corps charged with

¹ Read at the Joint Meeting of the Philadelphia Branch of the American Pharmaceutical Association and the National Pharmaceutical Service Association, October 8, 1917.

the duty of providing the medical and surgical supplies by purchase or manufacture and with the care, distribution and dispensing thereof, but they likewise make the sanitary, clinical and chemical examinations for the armies and in reality these pharmacists are the chemists of the military service as well as of the sanitary service. Very properly courses of special scientific study and training have been established for the education of the personnel of these corps and under the regulations the military pharmacy student must apply himself to the studies and in the required examinations demonstrate his fitness for the service. These rival countries in the existing war, have exhibited to the world the value of modern pharmaceutical and chemical service to the army.

The French pharmaceutical military service has rendered to that country, during this war, services that are inestimable, whether considered solely from the monetary value to their nation or as professional and humanitarian benefits. The Pharmaceutical Corps has been publicly commended "as having proved to be one of the most effective, active and intelligent corps of the French Army."

The organization and the duties performed by the French Army Pharmaceutical Corps will serve as a model for the proposed pharmaceutical corps of the United States army. The War Department is now actively engaged in organizing an American army in accordance with the plan of the French army organization and our forming units are being drilled according to the French army methods. Would it not be very appropriate at this time for the War Department to likewise adopt our ally's scheme of pharmaceutical corps cadre?

The history of the pharmaceutical corps of the French army, the services performed therein by many eminent pharmacists, the contentions necessary to maintain its standing and to overcome the jealousies of other branches of the sanitary service, the duties assigned from time to time, and the present status and greatly extended usefulness of the service, are interesting subjects of study which can here be given only a cursory consideration.

The writer is very largely indebted for the facts presented in this paper to M. Georges, Chief Pharmacist, Military Hospital for Instruction, Val de Grace; L. Guignard, Honorary Director École Supérieure de Pharmacie, Paris; Captain Carl Boyd, Military Attache, American Embassy, Paris, and above all to Léon Varenne, Phar.D., Pharmacist Major of the Army, for an autograph copy of his book on the Pharmaceutical Service in the Army.

"Organisation et Fonctionnement du Service Pharmaceutique de L'Armée" by Léon Varenne, Docteur en Pharmacie—Pharmacien Major de L'Armée. Preface by De M. le Professeur P. Cazeneuve Sénateur du Rhone.

The history of the French military pharmacists can be traced back to the time of Richelieu. In 1630, the regulations of the principal army hospitals defined the personnel of the hospital staff and the duties of the physician, surgeon and pharmacist.

The law of December 20, 1718, instituted officially the sanitary service and regulated precisely for the first time the duties of the hospital corps. The regulations of January 1, 1747, made provision for the formulas of the pharmacopœia of the Royal military hospitals with a list of drugs to be included in their supplies and further provided for commissions for the officers to be issued by the Secretary of War.

The acts of 1774, 1775 and 1777 further organized the sanitary service in the districts of Strasburg, Metz and Lille, with the grades of professors of medicine, surgeon-major and apothecary-major, the commissions for the officers of the Sanitary Council being respectively physician-inspector, surgeon-inspector and apothecary-major. Even at that early date the apothecary-major was charged with the duties of analyzing the remedies and providing all medicines.

In 1788, important modifications were made in the organization of the sanitary service. A sanitary council was formed consisting of six superior officers of the sanitary service; two physicians, two surgeons and two pharmacists (Bayen and Parmentier). At the same time, the number of the military hospitals was increased, the service in the regimental infirmaries extended and necessarily the duties of the physicians and pharmacists considerably augmented.

It is admitted that, at this period, medical influence was in the ascendancy and, owing to the excessive reduction in the number of pharmacists and duties that did not bring them in such close contact with the army, pharmacy was subordinated to medicine. It was the laboratory of Bayen, from which came, in 1765, the memorable analyses of the springs of Bagnères de Luchon and, in 1774, the essay on experiments with the mercurial precipitates, that overthrew the doctrine of Stahl and started chemistry along new lines, that prepared the way for the emancipation of pharmacy. Subsequently Medical Inspector Bégin, in his "Studies of the Military Sanitary Service," declared "that the sciences of medicine and

pharmacy were established on a perfect equality, lending mutual support and coöperating together while proceeding separately, nevertheless, in all the services which they render to humanity and in extending the domain of knowledge, they are equally honorable."

The situation created by the law of 1788 was fortunately modified by subsequent regulations and decrees which ameliorated the situation materially and hastened a reorganization of the sanitary service in 1796. The law enacted that year suppressed the Sanitary Council then in existence and their functions and powers were assigned to six inspector generals; two physicians, two surgeons and two pharmacists (the same Bayen and Parmentier), with equal authority over the three subdivisions of the sanitary service. The right of honorable distinction had already been accorded to all these branches of service by the regulations promulgated in 1792 and so the absolute equality of the three professions was established.

In 1803, an attempt was made to reduce the standing of medicine and pharmacy and advance that of surgery; the proposition being to have six inspector generals, three to be surgeons, two physicians and only one pharmacist. Subsequently the war department reduced the number of hospitals and neglected the sanitary service to a point where Talleyrand in his speech to the French armies on April 2, 1814, denounced a policy that expected the soldiers of France "to withstand the fire of the enemy without having subsistence and without hospitals."

During this period the sanitary cadres were very variable, depending largely upon the needs of the army in time of peace or in time of war. In 1812, the effective military pharmacists numbered 1,011 in the total of 5,112 officers of the sanitary service. In September, 1824, the personnel of the entire sanitary service numbered only 917 officers, classified as surgeons, 711; physicians, 59; and pharmacists, 147. By the act of August 12, 1826, this effective was again modified, the number of physicians and surgeons was increased, and the number of pharmacists decreased. This act, however, established the grade of pharmacist aide-major.

In 1852, the sanitary service of the army was arranged into two parallel and independent corps, medicine and pharmacy. The modern history and development of these corps can be stated to have been then inaugurated as a basis for fusion had been established and there was at least a temporary cessation of the rivalry and jealousies that had so long existed.

In 1860, Marshal Vaillant, minister of war, decreed that the two corps, medicine and pharmacy, should be of equal importance, irrespective of their total effectives. By this decree the pharmaceutical cadre consisted of 159 officers with the following grades:

- 1 Pharmacist-Inspector, with the grade of General of a brigade.
- 5 Pharmacist Principals, 1st Class, with the grade of Colonel.
- 5 Pharmacist Principals, 2d Class, with grade of Lieutenant-Colonel.
- 36 Pharmacist-Major, 1st Class, with grade of Chief of Battalion.
- 42 Pharmacist-Majors, 2d Class, with grade of Captain.
- 55 Pharmacist Aide-Majors, 1st Class, with grade of Lieutenant.
- 15 Pharmacist Aide-Majors, 2d Class, with grade of Second-Lieutenant.

The shortcomings of the sanitary service during the Franco-German war were severely criticized and a strong demand made for its reorganization. The medical corps demanded exclusive direction and autonomy over the service and that the pharmaceutical corps should become the subordinate and in consequence a systematic reduction of the authority of the military pharmacists. The eminent chemist, J. B. Dumas, gave the weight of his scientific authority in favor of placing the direction of the sanitary service exclusively under the medical and consequently the subordination of the military and administrative influence of pharmacy. The medical inspector-general Legouest, while ardently advocating the preëminence of the medical over the pharmaceutical, declared that "the project must respect the cadre and rank of the military pharmacists and that there must be preserved to pharmacy all its rank, its appropriation, the conditions of advancement and the various functions of its proper service."

In 1882, a new law was promulgated for the administration of the army and with the amendment thereto of 1889, defined the authority of the military sanitary service and to the present time this governs the duties of the service. This law for the administration of the army divided the military service into five branches, the sanitary service being the last specified. Prior to this time, the military sanitary corps was part of the commissary department. It now became a new autonomy comprising the military physicians and pharmacists under one proper hierarchy and with the grades corresponding to those of the military hierarchy and the officers of the sanitary service enjoying all the advantages of other officers.

Under this law the pharmaceutical cadre is composed of:

- 1 Pharmacist-Inspector, with rank of General of a brigade.
- 4 Pharmacist Principals, 1st Class, with rank of Colonel.
- 5 Pharmacist Principals, 2d Class, with rank of Lieutenant-Colonel.
- 30 Pharmacist-Majors, 1st Class, with rank of Chief of a Battalion.
- 45 Pharmacist-Majors, 2d Class, with rank of Captain.
- 20 Pharmacist Aide-Majors, 1st Class, with rank of Lieutenant.
- 10 Pharmacist Aide-Majors, 2d Class, with rank of Second-Lieutenant.

This total of 115 was soon seen to be insufficient, as was shown by the sanitary service in Morocco. When the necessity arose, the reserve pharmaceutical corps was to be mobilized. In 1914 this reserve force numbered 1,229 and, in the territorial army, 1,020, a total reserve corps of 2,249.

The pharmaceutical corps in the French army is recruited in part from students of pharmacy who enter the army sanitary service and continue their studies while in the army, and in part from pharmacist graduates who hold first-class diplomas. The undergraduate who enlists in this service must establish that he is a citizen of France either by birth or by naturalization, that he is over 18 years and less than 23 years of age, must have passed the preliminary scholastic examination and have his fitness for military service certified to. As a student he is allowed an annual pension, while attending the school of applied medicine and pharmacy, of 1,000 francs which, it is stipulated, is allowed on condition that he complies with the rules of the school and passes the examination for admission to the service, otherwise it must be refunded to the war department.

The examination for the first year studies of the military pharmacy student, covers a composition on some question of physics or elementary inorganic chemistry; the preparation of one or more medicinal formulas included in the Codex, with an examination on these preparations; the compounding of prescriptions; the determination of fifteen plants or parts of plants pertaining to materia medica and ten chemical medicaments or galenicals and examinations on these.

The examination at the end of the second year includes the following: a composition upon an inorganic or an organic chemical

question; examinations in physics; organic chemistry; mineral poisons; galenical pharmacy; botany (natural families of phanerogams); and the natural history of medicaments. The jury composed of the Pharmacist-Inspector (as president) or, in his absence, a Pharmacist Principal of the first class, a professor of chemistry and toxicology of a School of applied Military Sanitary Service and a Pharmacist-Major, 1st Class, classify the students according to the merits of their work and certify to the ministry the list of candidates eligible for appointment to the service.

Pharmacists possessing first-class diplomas may enter the pharmaceutical corps from civil life with a grade of Pharmacist Aide-Major, 2d Class. Such candidate, however, must first comply with the following conditions: be a citizen of France, either by birth or by naturalization, be not over 28 years of age; his aptitude for the service must be certified to by an army physician of not less grade than Physician-Major, 2d Class, enlist for not less than six years in the active sanitary service of the army and accept appointment to the grade of Aide-Major, 2d Class, and in addition must pass an examination to determine his scientific and professional knowledge.

The candidate meeting these rather rigorous requirements for enlistment in this corps with the grade of Aide-Major, 2d Class, receives an indemnity of 575 francs to provide for his first equipment with a condition that this must be refunded if he quits the service before completing his sexannual engagement. The pharmacists are expected to continue their studies and to obtain promotion to higher grade a successful examination is necessary. Each advancement in the corps is dependent upon a minimum number of years of effective service and seniority of service is presumably respected in the advance appointments.

A Pharmacist-Major, 2d Class, is expected to serve not less than two years before advancement.

A Pharmacist-Major, 1st Class, is expected to serve at least four years in the preceding grade.

A Pharmacist Principal, 2d Class, is expected to serve at least three years in the preceding grade.

A Pharmacist Principal, 1st Class, is expected to serve at least two years in the preceding grade.

A Pharmacist-Inspector is expected to serve at least three years in the preceding grade.

The officers of the Pharmaceutical Corps may be retired with

pension on arriving at specified age limit for their respective grades as follows: the Pharmacist-Inspector, at 62 years; the Pharmacist Principal, 1st Class, at 60 years; the Pharmacist Principal, 2d Class, at 58 years; the Pharmacist-Major, 1st Class, at 56 years; the Pharmacist-Major, 2d Class, at 53 years; and the Pharmacist Aide-Major, either class, at 52 years.

The limits of this paper preclude the detailing at length of the divers duties assigned to the pharmaceutical corps in time of peace and still more so, the greatly increased and many special services that have been required in time of war.

The military hospitals are under the command of the medical officers. The "head physician" usually follows the custom of entrusting to the head pharmacist, whose official authority extends only over the pharmacists, assistants and medical supplies, the maintenance of discipline and the command of the civil and military attaches of the hospital so that the ranking pharmacist generally becomes the administrative officer charged with the policing, and the commissary as well as the necessary pharmaceutical duties of providing the medical and surgical supplies and attending to the compounding of all medicines and their administration.

The regulations require that the pharmacist must verify the quality of the medicines supplied and select the most suitable conditions and places for their preservation, adopt a system that will prevent errors, see that, at the time of dispensing, the medicines comply with the requirements of the "Military Hospital Formulary" and are labelled according to the requirements, maintain the records of prescriptions and of the supplies according to the official forms. He is likewise charged with the duty of delivering medical supplies to the regimental infirmaries and veterinary hospitals. He must supervise the preparation of food for the invalids. Must systematically care for and examine the supplies of the sanitary service and must receive the various supplies for the clothing and subsistence. He must make all examinations of foods and medicines and those requested by the medical officers for the diagnosis of disease, the hygiene of the troops and the divers services of the army. All of these analyses must be properly recorded with the date, the reason for the investigation and the results set forth. The analyses for the hospital service, with results and observations, are to be promptly transmitted to the physician in charge.

Finally, the pharmacist is charged with the duty of making the meteorological observations.

With the outbreak of the war and the greater demand consequently for military pharmacists, the government instituted a pharmaceutical section in each of the schools for the Army Sanitary Service and the pharmacist recruit was given the choice of attending at any one of these situated at Paris, Montpellier, Nancy, Bordeaux, Lille, Lyon, and Toulon. The faculties of these were composed of medical, pharmaceutical and chemical teachers and many leading pharmacists were detailed to duty as teachers.

The disposition of the pharmaceutical corps was necessarily changed by the existing war conditions and the demands made upon the service by the exigencies arising have been enormous and could not have been foreseen. The objects sought to be attained by the organization of the sanitary corps in the war were: (1) providing for the preparation and execution of measures of hygiene and prophylaxis; (2) the prevention and treatment of sicknesses incident to the march and to the camp; (3) the first treatment in combat, the relief and removal of the wounded irrespective of nationality; (4) hospitals for treatment of the sick and wounded; (5) the replacement of the personnel and the re-supplying of materials of the sanitary formations.

In each of these the pharmacists are assigned specific duties as for example an ambulance unit in the infantry is provided with six physicians and one pharmacist.

In the campaign, the pharmacists are assigned in the front rank giving service to their regiments and with the infantry ambulance; in the rear, with the ambulances of the section; the evacuation hospitals; the sanitary trains, either permanent or improvised; the supply depots, the reserves of the sanitary personnel.

The pharmacist is charged with the duty of determining the potability of the water supplies and generally likewise acts as bacteriologist of the division. The specified lists of apparatus and reagents needed for these tests are transported according to the regulations by the litter bearers.

It is the mission of the pharmacist to attend the ambulances during battle, to render first aid, remove the wounded, to supply the hospital material and attention at the field hospital. The pharmaceutical personnel by the decree of April 26, 1910, has become the principal formation of the infantry ambulance. This consists of the following under the command of the pharmacist: a detachment of four attendants as litter bearers and nurses, one corporal and a detachment of four men of the military train.

The material comprises three wagons of the sanitary service to transport seven paniers of dressings, seven cases and nineteen bales of hospital materials.

The important duties assigned to the sanitary service in the rear are the evacuation hospitals, sanitary trains, the war infirmaries, the stations for the convalescents and maimed, the reserves for the personnel of the sanitary service of the army, the reserve material for the service, and the supply stations.

Each evacuation hospital is provided with two complete infantry ambulance outfits and provisions for two sectional hospitals and two disinfecting apparatus and supplies of disinfectants, and fumigating material and two pharmacists are assigned thereto.

The medical supply stations are under the direct command of a pharmacist with a personnel of one sub-officer, one corporal and seven attendants. The various hospitals, temporary, permanent and auxiliary, all meeting at times the local civil demands, draw their supplies from the nearest supply station. An important duty of the pharmaceutical corps is the continuous supplying of the medical needs of the various formations of the sanitary service whether at the army front, in the rear or in the interior or in the territorial hospitals and stations.

The conservation of supplies of important medicaments so that the needs of the army and the civilian population were alike provided for in this war, was one of the greatest national services performed by the Pharmaceutical Corps of the Army.

The regulations provide that the pharmacists in a campaign must assure that the pharmaceutic service conforms to the instructions and to their spirit. Under the orders of the Chief Physician, they must verify the nature and quality of the medical substances and provide these by purchase, manufacture or requisition; they must participate in the inspection of the foods and beverages supplied to the camps and cantonments; must examine all the medicines when received and make monthly reports of receipts and disposition of the supplies on the official forms provided. During the war, the work of the pharmacist has been extended to prepare many of the sanitary materials and medicines the necessity for which has been established by experience. Among these newer preparations may be mentioned sterile solutions in ampoules, artificial serums and compressed oxygen.

The French War Department has taken advantage of the apti-

tude of the pharmacists and their professional education and has utilized them as chemists and hygienists. Every means that could be developed by science was applied by German ingenuity to the production of barbarous war instruments and methods. The irritating, asphyxiating and poisonous gases and the pollution of water supplies are notable examples of the methods initiated by the enemy and requiring scientific counteraction.

This demanded extension of the sanitary service could not be imposed upon the military physicians who were too fully occupied with the problems of their own practice and, likewise, it was admitted that they were but poorly prepared for this field of work. Consequently, it became the duty of the pharmacists of the sanitary service to make the innumerable chemical, microscopical and bacteriological examinations necessary. It was soon learned that the analytical outfit accompanying the ambulance was insufficient for satisfactory work under the conditions existing. A complementary cadre was organized consisting of 200 additional pharmacist aide-majors and 220 portable laboratories were equipped. These constitute a special formation of the sanitary service on the front and they are charged with the constant daily surveillance of the water consumed by the troops and the providing for the purification and sterilizing of any that are doubtful or purposely contaminated by the enemy.

Despite this scientific work which became more and more overwhelming, and the complex problem of regularly furnishing the medicines and surgical supplies for all of the sanitary formations, some other researches have been carried on and a number of suggestions of importance to the industries of the nation have emanated from this corps. Withal there has been no abatement of the rigid rules of administration and the strict methods of making records and the rendering of surgical assistance as well as purely pharmaceutical service.

The writer is indebted to L. Guignard for the accompanying diagram which graphically portrays the service that the pharmaceutical corps of the French army is rendering to that nation.

The preface to the able work of Major Léon Varenne was written by Prof. P. Cazeneuve, senator from Rhone. It is a concise review of the service being performed by the military pharmacists. He pays a deserved tribute "to their devotion and patriotic service, although silently given, to which the historian must in jus-

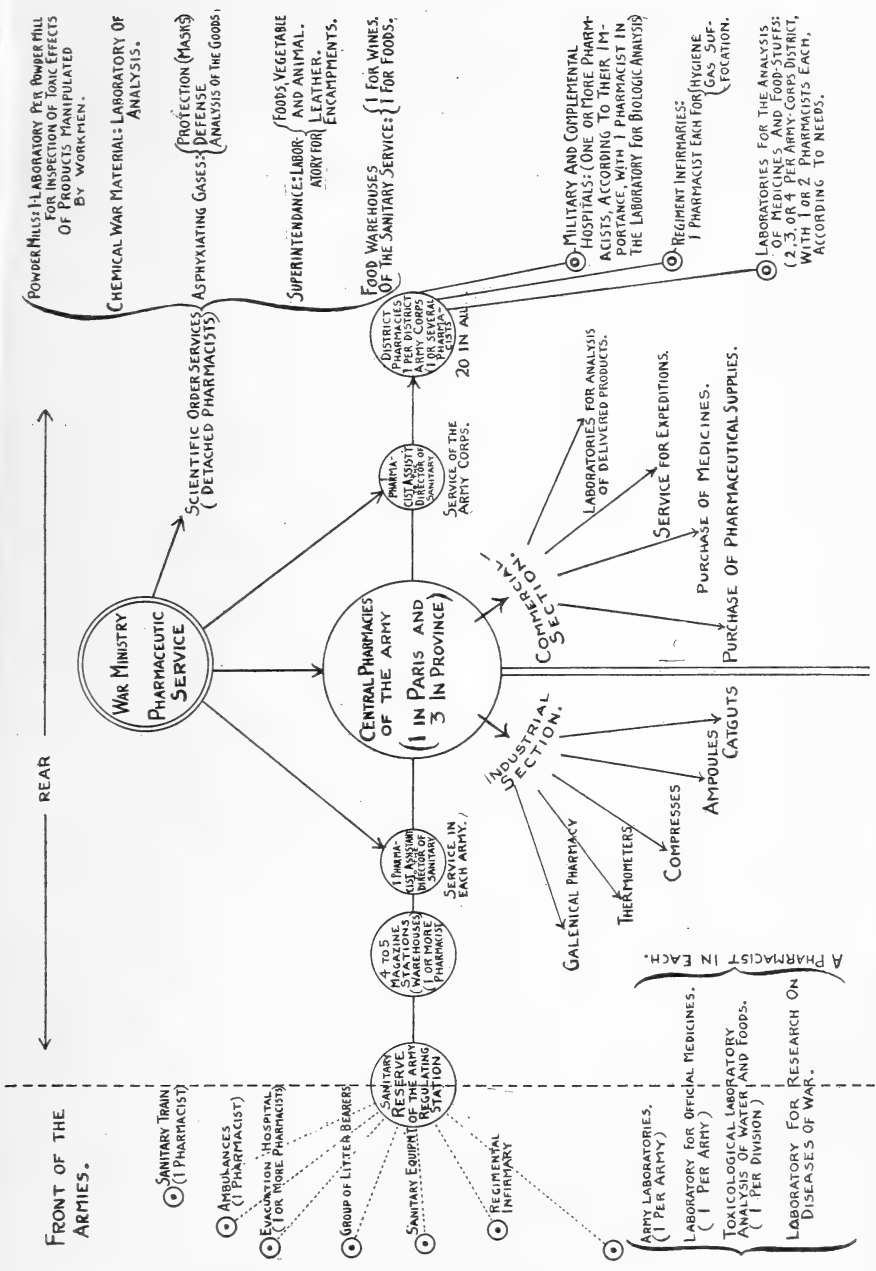


DIAGRAM EXHIBITING THE PHARMACEUTICAL SERVICE IN THE FRENCH WAR DEPARTMENT.

tice render homage." He states "this work of M. Varenne makes us love and respect this select corps which have contributed, in their modest sphere, most eminent service to save the country." No one reading even the preface of this book should longer doubt the importance of the pharmaceutical corps in modern warfare and the absolute necessity for such service to protect the health and lives of the troops.

PHARMACISTS AND THE WAR.

BY H. M. WHELPLEY, PH.M., ST. LOUIS, MO.

(Read at the 1917 meeting of the Missouri Pharmaceutical Association.)

Twelve months ago we met here and expressed privately our opinions of the human slaughter then going on in the old world. Since then, the war cloud has extended until it is now easier to name the countries that are at peace than it is to enumerate the ones engaged in the greatest and gravest of all human conflicts. One year ago we congratulated ourselves that the United States was not in the struggle. Now we are preparing to enact the most important part in "making the world safe for democracy." These are, indeed, momentous days. The entire Western World will likely be a participant in the contest before our next Missouri Pharmaceutical Association convention. The six weeks' war which started in 1914 may continue far past that number of years. These are thought-provoking times for every citizen. The words "citizen" and "alien" have assumed a new and grave significance. It is not difficult to recognize our duty to our country and to the human race in our determination of "setting the world free." But we are pharmacists by training and occupation. The retailer has long practised serving the public. How can pharmacists now serve their country? What more have they to offer than physical fitness and eligible age? Will the pharmacists of the United States, as the years of war go on, be found digging trenches "somewhere in Europe" or will they contribute service dependent on pharmaceutical skill and knowledge?

Unfortunately, our own government does not give pharmacists the recognition in a war that they receive in France, Italy, Japan and Germany. But that recognition may come before this long-

drawn-out war is over. To-day, the pharmacist has the best opportunity for service in the navy. He also has a place in the army and one in the Public Health and Marine Hospital Service. All young men now in pharmacy, and particularly those just entering as apprentices should make certain of having sufficient preliminary education. They should push their studies in pharmacy at college or home, as the case may be. Those who cannot enlist will find plenty to do without going to war. The cry for drug clerks, is already loud and will become more insistent as the drafts follow each other. The Medical Section of the Council of National Defence is pleading with physicians to enlist. We do not hear a government cry for more pharmacists but this country is just approaching participation in the war.

We are equally concerned with problems affecting the pharmacists who remain at home to follow their calling. It is needless to say that they will be affected by all general taxes, food regulations and other conditions imposed on the public at large. The special taxes on their business and high cost of drugs they should be able to pass on to the consumer, where these belong. I regret that some retail druggists continue, even at this late date, to sell drugs at figures based on original cost instead of market value. One druggist disposed of his entire stock of potassium permanganate at less per pound than he can replace the chemical per ounce. Similar cases occur daily in spite of drug price lists and market reviews. Pharmacists are quite as likely to make a success of drug gardens as they are to glut the market from their home truck gardens, but that is not saying much. No one should attempt a drug garden before consulting with the government Department of Agriculture, at Washington. In England, the British government reports quite as much success in harvesting wild drugs as in cultivating plants. It must be remembered that England has a much more restricted flora than is the case in the United States. We have a long list of indigenous drugs and the varied climate, latitude, altitude, etc., necessary for the growing of many exotic plants.

Now, to be more personal, I bring home to you the duty we owe the Missouri Pharmaceutical Association which secured our original pharmacy law of 1879 and for nearly forty years has had a hand in all pharmaceutical progress in Missouri. War or no war, we should continue to develop and expand the organization. Here we can solve practical questions in a practical way.

One form of recognition which our government has recently given pharmacy is to use the laboratories and faculties of certain colleges of pharmacy for testing medical supplies. This is done in lieu of establishing government testing laboratories.

Now, in conclusion, this horrible war is waged to make the world better and mankind secure from molestation. At the same time, let us gain for pharmacy a just position and recognition. We bewail the fact that our government is far behind Japan in using in war the talents of pharmacists. I quite agree with Hugh Craig, when he says: "The pharmacist has been so careless of his position in the social economy as to leave the public ignorant of his deserts."

I feel that we should not be satisfied after the war with a status quo ante but now look forward to better pharmacy after the war.

PHARMACISTS IN THE AUSTRALIAN ARMY.¹

In view of the appointment of a joint committee to inquire into the position of qualified chemists in the Royal Army Medical Corps it is interesting to observe that in Australia the advantages of utilizing the services of pharmacists in the army are well recognized. Major Cossar—a Victorian chemist—explained the position recently as follows. The first commissioned appointment for pharmacists was made in November, 1915, when Lieutenant W. D. Williams was placed on the staff of the principal medical officer. In that position he has saved thousands of pounds to the country. Lieutenant Fox was next appointed quartermaster in South Australia, and Lieutenant George had been in the camp at Blackboy Hill in western Australia. In February, 1916, each of the State Pharmaceutical Societies was asked to nominate a senior pharmacist for each military district. Captain Cowley in Queensland, Captain Wadsworth in New South Wales were both appointed. Lieutenant Fox was made a captain in South Australia, and put on the staff of the principal medical officer. Captain Drake was appointed in Tasmania, and Captain Cossar was raised to the rank of major, and Captain Dartnell was appointed senior pharmacist of Victoria in his place. Since November, 1915, a base depot has been established in

¹ From *The Chemist and Druggist*.

each capital, which supplies the whole of the medical requirements of the forces, and great progress has been made in systematizing and economizing by this means. A beginning has been made in manufacturing. The base depots save the commonwealth thousands of pounds per month. Every military hospital of over 220 beds has now a pharmacist appointed as lieutenant-dispenser on the staff. Tasmania is the only state in which such a hospital does not exist. A military order has been made that no one is to dispense medicine and drugs unless he is a registered pharmacist. Numerous efforts had been made to secure commissions for the men who enlisted earlier and were abroad before these arrangements were made, and it is probable that shortly every hospital in the field with 440 beds or over (as against 220 beds in Australia) will be in charge of a registered pharmacist—as honorary lieutenant. Every hospital-ship now has a pharmacist as lieutenant-dispenser, and every transport carrying more than 500 men must have a registered pharmacist in charge of the dispensary. It is not possible to secure a commission for every pharmacist in the Army during the war, but every registered pharmacist-dispenser is now sure of the position of staff-sergeant. In the future when every young pharmacist will have military training in the Citizens' Army, it will never be necessary to train the special sergeant compounders.

STATUS OF CHEMISTS IN HOSPITAL UNITS.¹

A correspondent, under date of July 17, 1917, writes us in part as follows:

"I was in the position last June of some uncertainty as to a choice of work for the following year. I had just been granted the degree of Ph.D. in chemistry from one of our leading universities, and, although several months past the registration age, was desirous of serving in a capacity most useful to my country. This left me undecided as to a choice of positions open to me. At this time the chief of a large hospital unit then in course of organization for service in France, called up the head of our chemical department, requesting a chemist for the unit, specifying a Ph.D. man capable of tackling any original problem that might arise at the base. The faculty selected me to see the physician in charge. In short, I was asked if I was a Ph.D., whether I had done any original research, and whether I would accompany

¹ Reprinted from *The Journal of Industrial and Engineering Chemistry*, August, 1917.

the unit as chemist—one of the enlisted men. My question as to a commission was met with the reply that only physicians and dentists were given commissions, but the possibility was mentioned that I *might* be offered a civilian appointment at fifty dollars a month.

"I refused, although I wanted very much to go. I had minored in bacteriology and had six years experience in health department laboratory work, and felt able to do good work with the unit. My refusal was for two reasons. The money borrowed for my education had to be repaid as soon as possible and that was impossible on a small salary with unknown expenses. Also, I felt that expecting to get a university-trained chemist and in return offering enlistment with orderlies, cooks and barbers was insulting to the dignity of the profession, when men no more highly trained—physicians and dentists—were granted a higher rank. I have written thus at length, partly on the urging of chemist friends. I am now adjunct professor of chemistry at the University of ———.

"Although disappointed at the lack of recognition accorded chemists by the army officials, I am writing you not in a spirit of complaint, but that you may have the facts of such a case, in the event that it should become advisable later for chemists to seek recognition.

"Another very similar case has just come to my attention here at ———, where a unit is now being organized."

The situation here revealed is amazing. We incline to the belief that this does not represent the deliberately formulated policy of the War Department, but that in the rush of unusual organization the matter has simply been overlooked. If, however, these surmises are incorrect, then we respectfully urge an early review of the subject by the officials in charge.

PHARMACOLOGIC SUPERSTITIONS.¹

BY HORATIO C. WOOD, JR., M.D., PHILADELPHIA.

(Continued from page 460.)

It is evident, therefore, that science lends no support to the use of lithium in medicine. Any judgment in favor of this element must be based solely on bedside experience. The clinical evidence in this disease is peculiarly unreliable; Magnus-Levi says, "Cool judgment is more difficult in the therapeutics of gout than of any other disease." In the first place, there is no criterion, save possibly the percentage of uric acid in the blood, which can serve as an index of improvement. In the second place, the disease is one

¹ Reprinted from the *Journ. Amer. Med. Assoc.*, Vol. LXVI, pp. 1067-1073.

which runs a very variable as well as chronic course; there are inexplicable spontaneous fluctuations in the severity of its manifestations. In the third place, the lithium is always employed in conjunction with other therapeutic measures, especially the ingestion of large quantities of water, and it is impossible for any one to say with positiveness whether any improvement which may have occurred has been due to or in spite of the lithium.

Nevertheless, regardless of its manifest fallacy, the lithium superstition still survives. This I believe is chiefly because of the beneficial effects of the so-called "lithia waters" in various conditions of disturbed nutrition. These waters, however, rarely contain more than one part of lithium in a million. That is, to get 5 grains of lithium, the patient would have to drink about 30 gallons of water! While I do not wish to deny the benefit of water in gout, I am quite certain, as must be any other rational human being who knows the facts of the case, that the value of the so-called lithia waters does not reside in their lithium content.

SARSAPARILLA.

Various preparations of sarsaparilla, mostly of proprietary nature, are widely used by the public as "blood purifiers." This term is apparently a survival of the old humoralistic pathology which considered all diseases to be due to evil humors in the blood. During the days when this theory was rampant, physicians purged, sweated and bled their patients more thoroughly than wisely in their efforts to eliminate the *materies morbi*. Sarsaparilla has a mild diaphoretic tendency, and might therefore be of some assistance in this eliminative therapeusis. Among the medical profession, however, it never enjoyed any great vogue except in the treatment of syphilis. Today it is used almost exclusively in the form of the compound syrup of sarsaparilla, partly as a means of disguising the tastes of the iodides and partly because of a sort of half belief that it may enhance the antisiphilitic action of mercury.

In regard to the use of compound syrup of sarsaparilla as a vehicle, it may be pointed out that its pleasant flavor is due to the aromatic oils, licorice and sugar which it contains; sarsaparilla itself has a mucilaginous and somewhat bitterish taste, and as far as the flavor of the syrup is concerned is of no advantage. In addition to these ingredients, the compound syrup of sarsaparilla also contains 1.5 per cent. of senna. This quantity of senna is of course too small

to have any laxative effect in the doses of the syrup ordinarily administered, and if a laxative action is desirable it is necessary to reinforce the syrup with some cathartic. If, on the other hand, a laxative effect is not desired, the small quantity of senna can serve no therapeutic use and certainly does not improve the flavor of the mixture. As a vehicle, therefore, the combination is quite irrational.

As an antisyphilitic, sarsaparilla was introduced into Europe in the middle of the sixteenth century, having apparently been copied from the South American aborigines. After a brief popularity it fell into desuetude and was but little used until its revival by William Fordyce in 1757. This author¹⁷ reported thirteen cases of syphilis which he treated with the drug with results satisfactory at least to himself. He asserted that the remedy had fallen into disrepute because of the ignorance concerning the class of cases for which it was suitable and the proper method of preparing the decoction; he states that those who had failed with the drug "all erred in macerating it so long in the water before they boiled it, which spoils it for the next day." The only pharmaceutic preparation which he recognized was made as follows: Three ounces of as fresh a sample of the root as obtainable were added to 3 quarts of water and brought to a boil immediately in an open vessel, the boiling continued until all but 2 pints of the water had evaporated, when it was strained and the liquor given within a period of twenty-four hours, usually divided in two or three doses. Frequently it was used in conjunction with some form of external heat, and under these circumstances produced profuse diaphoresis. Dierbach¹⁸ describes the method of using sarsaparilla in the treatment of syphilis as follows: Half a pound of the root cut up fine is macerated with water till it is in a thick slimy condition, and then pressed through a cloth. Of this fluid the patient drinks early in the morning a glassful and then goes to bed, covers up warmly, and sweats for two hours. If he gets thirsty he must drink nothing else but the sarsaparilla slime.

In twelve out of the thirteen cases reported by Fordyce, mercury had been used either before or during the treatment with sarsaparilla, and as he records a case as cured as soon as the external manifestations of the infection have subsided, it is quite impossible to draw any conclusions as to whether or not his treatment really had

¹⁷ Fordyce, William: Medical Observations and Inquiries, 1757, i, 149.

¹⁸ Dierbach: *Jour. d. pract. Arzник. u. Wundarznk.* (Hufeland's), 1837, lxxxiv, 40.

any effect on the progress of the malady. In the single case in which mercury was not used, the patient was a woman with a syphilitic ulcer of the nose. The author says of the result, "By the use of the decoction for fifty days inwardly and outwardly applied as before mentioned, all the sores healed up, some of the bones threw off exfoliations, others covered up without any sensible exfoliation, she recovered her health perfectly with only the loss of the bones of her nose." He himself seemed to have had subconscious doubts as to the efficacy of the treatment, for in reporting another case he says, "But as I durst not in such a case trust entirely to it (sarsaparilla) I now and then used the mercurial ointment to the quantity of half an ounce of quicksilver in the whole." On such a slender thread of clinical evidence hangs the modern use of sarsaparilla as an antisiphilitic!

The only ingredients in sarsaparilla, aside from the mucilage it contains, which could be suspected of possessing any therapeutic virtues are certain glucosidal bodies related to the saponins. As far as has been determined, the sarsaparilla saponins have no effect on the system which is not common to all of this large group of vegetable principles, and the only therapeutic influence that modern pharmacology assigns to the saponins is due to their local irritant effect on the mucous membrane of the stomach. By virtue of the nausea which they produce, they may increase the secretions of the bronchi and of the skin, and are therefore used in some quarters in the treatment of acute bronchitis.

The case for the use of compound syrup of sarsaparilla as an antisiphilitic may be summed up as follows: There is absolutely no explanation of any possible mode of action of the drug. The clinical evidence of the usefulness of sarsaparilla is both scanty and unreliable. Such testimony of beneficial action as does exist is based on the use of doses of from 2 to 4 ounces of sarsaparilla a day; this would be equivalent to about 5 fluidounces of the syrup three times a day. Therefore, in the dose ordinarily employed, there is not the slightest reason to suspect that the compound syrup of sarsaparilla can have any effect on the syphilitic process. As a vehicle it is an illogical jumble.

BASHAM'S MIXTURE.

I have no statistics to determine the number of physicians who believe that Basham's mixture is a sort of specific for Bright's dis-

ease. The fact that the popular names of the drug and of the disease begin with the same letter of the alphabet seems, to a certain type of mind, final proof that they were meant to go together.

Some years ago, at the time when it was believed that astringents might be absorbed into the blood, ferric chloride was recommended for the purpose of diminishing the quantity of albumin in cases of parenchymatous nephritis. According to present pharmacologic and pathologic theories, however, this seems neither possible nor desirable.

It is generally held today that the action of astringents is due to coagulation of the bodily proteins. If this view is correct, it is evident that no astringent can exist in the blood, for it would at once precipitate the blood serum, and a fatal thrombosis or embolism would occur. As we are entirely ignorant concerning the mechanism of albuminuria, it is impossible to theorize as to whether, if an astringent could reach the kidney, it would diminish the amount of albumin in the urine. There is not, however, the slightest reason to suppose that to diminish the albumin by any such mechanical means would be of the least benefit to the patient. To hide the rottenness of a beam with a coat of paint does not strengthen the building, nor does the prevention of the excretion of albumin lessen the inflammatory process in the kidney. There are symptoms whose relief is desirable, although we know that in relieving them we do not affect the progress of the disease; but albuminuria can hardly be classed as such a symptom.

I do not wish to be understood as attempting to deny the value of iron in certain cases of nephritis. There is no room for doubt that when Bright's disease is complicated with anemia, as it so often is, the use of this drug is beneficial. This, however, is somewhat beside the question; my main contention is that iron in no form exercises any specific effect on the kidney. It is indisputable that when the renal condition is complicated by anemia, iron, because of its hematinic effect, may be useful; but there is no ground for the superstition that Basham's mixture exercises a special influence. Nevertheless Tyson¹⁹ is forced to remark, "It is prescribed constantly in the most reckless and thoughtless manner."

Dr. Basham, who seems to have originated the mixture of ammonium acetate with ferric chloride which goes by his name, was no believer in the antiquated astringent hypothesis or yet in the specific

¹⁹ Tyson: *Practice of Medicine*, 1900.

anti-nephritic theory of the effects of iron, for he says in his work on renal disease, published in 1870: "Preparations of iron are the best aid to the blood forming function. But iron in any of these preparations cannot generate blood corpuscles. They can only be formed out of the nutritious elements of the food." In another place, "A long experience of these and other forms of renal disease where the object of the treatment is similar has, however, convinced me that a soluble ammonio-chloride obtained by acidulating liquor amonii acetatis with dilute acetic acid, and then adding the tincture of the perchloride, is the most efficacious of all the so-called preparations of steel." I cannot assent to Dr. Basham's dictum that the solution of iron and ammonium acetate is the most efficacious preparation, for while there is no doubt as to its chalybeate power, its acidity and astringency make it peculiarly liable to disturb the digestive tract.

It verges on sophistry to attempt to justify the use of Basham's mixture in nephritis on the ground of its adding the diuretic effect of the ammonium acetate to the chalybeate action of the iron. If a saline diuretic be deemed desirable, it should be given separately so that the dose of one or the other may be increased according to the requirements of the individual case. It is manifestly bad therapeutics to administer a diuretic if not indicated simply for the sake of obtaining the action of iron on the blood.

While on the subject of iron, I feel impelled to say a word concerning the misapprehension as to the effects of this metal on the system. It is not in any proper sense a "general tonic," whatever that phrase may mean; it has one specific therapeutic action, namely, to increase the hemoglobin content of the blood. Outside of this and the local effects of certain salts, there is no known physiologic action of iron which gives any ground for its therapeutic employment.

FERRIC CHLORIDE.

Also I cannot resist saying a word about the use, or rather abuse, of ferric chloride as a hematinic. It would seem as though large numbers of the medical profession were unaware that there was any other soluble salt of iron known to chemistry, unless they have recourse to the advertised proprietary preparations. The pharmacopeia recognizes a soluble citrate, a soluble phosphate, an iron and ammonium citrate, as well as various compound salts of iron. The chlorid is one of the most highly astringent preparations of iron

which we have, and therefore liable to cause constipation. It is strongly irritant to mucous membranes, and in delicate stomachs will often provoke nausea. The widespread employment of various proprietary forms of iron is due largely to the dread of disturbing the patient's digestive tract with the inorganic salts, a fear which is the outgrowth of unpleasant experiences with the tincture of ferric chloride. I have heard a physician who passes among his fellows as being exceptionally educated speak of this solution as the "strongest" form of iron. What he meant I have been wondering ever since. As a matter of fact, 10 minims of the tincture of ferric chlorid contains less iron than a single Bland's pill. As an external remedy for checking hemorrhage it is very valuable; as an internal drug it should never be employed.

OPIMUM AS A LOCAL REMEDY.

There is many a man who, while denying any accusation of being superstitious, nevertheless hesitates to make the thirteenth person at a table, or who has some pet habit which he regards as an omen of good luck. In a very similar way there are many physicians who profess to realize that opium has no local action but nevertheless persist in employing it as a topical remedy. And there may still be some superstitious enough really to believe that a drug so potent as a cerebral depressant must of necessity have powerful local effects. Among the most common evidences of this belief may be mentioned that ancient, if not honorable embrocation known as lead water and laudanum, the addition of opium to nutrient enemas to quiet the rectum, but above all the use of the opium suppository in various pelvic inflammations. The first of these has perhaps a slight theoretical justification, but the other two are as senseless as the incantations with which the ancients preceded their nauseating concoctions.

Crude opium frequently has a marked local irritant effect. The United States Dispensatory says, "When long chewed it excites much irritation in the lips and tongue and may even blister the mouths of those unaccustomed to its use." Dr. Hill in his history of materia medica, published in 1751, remarked of opium that "if kept long on the skin it takes off the hair and it always occasions an itching in it; sometimes it exulcerates and raises little blisters if applied to a tender part," and he recommended its use as a counter-irritant. I have myself seen two cases in which blistering followed

the local application of lead water and laudanum, but whether as a result of this application I cannot say.

Of course a counterirritant would likely be beneficial in various forms of arthritis in which Goulard's extract is commonly employed, and theoretically the counterirritant effect of opium might be beneficial. To this sophistical defense, however, it may be replied in the first place that we have a host of other counterirritants more reliable and safer than opium, and secondly, most of those who use it seem to do so with the idea that the opium will add anodyne or antiphlogistic effect to the astringency of the subacetate of lead. Of the local anesthetic action of opium I shall speak in a minute, but first let me digress briefly to say a few words on the astringent action of the leaden half of this medieval embrocation.

While it is true that lead acetate is an astringent, when applied over the skin its astringent action must be expended altogether on the superficial layers of the epiderm. Moreover, as is well known, when the lead is combined with the opium, it is precipitated as an insoluble meconate. Although some of the older writers attributed mysterious virtues to lead meconate, there is no reason to believe that it possesses any properties not common to the insoluble salts of the heavy metal, such as bismuth subnitrate. The improvement which follows local applications of lead water and laudanum is due in part to the lint and bandages which hold it in place, perhaps slightly to the alcohol, but chiefly to the action of time which passes by while the application is left in place.

When for any reason the ingestion of food must be interdicted for a considerable period of time, and an effort is made partially to maintain nutrition by the use of rectal feeding, the physician is confronted with the difficulty that the rectum soon becomes irritated, and ejects the enema before the nutrient it contains can be absorbed. To prevent this nearly every textbook on medicine recommends the addition of tincture of opium to the enema. This recommendation is based on the belief that opium, by virtue of its local anesthetic effect, will so benumb the mucous membrane of the bowel that it will not feel the presence of the nutrient injection. On what this belief in the local anodyne effect of opium is based I do not know; nor do I believe that its adherents themselves have any definite idea of the origin of the fable. It is true that Wiki²⁰ found that the injection of the alkaloids of opium beneath the skin lessens the activity of

²⁰ Wiki: *Arch. interat. d. pharmacod.*, 1911, xxi, 415.

peripheral sensory nerves. In his investigation potassium carbonate proved itself a more powerful local anesthetic; but how many would trust to potassium to calm the peristalsis of the rectum.

It may seem impiously iconoclastic to doubt the hallowed superstitions of the opium suppository. There appears to be in the minds of those who use it a subconscious delusion that as the rectum is nearer to the pelvic organs than the stomach, the opium must act more powerfully on this portion of the body when given by suppository than when given as a pill. As a matter of fact, however, physiologically the rectum is farther away from the pelvis than the stomach. For opium placed in the rectum to reach the bladder, it must be absorbed into the circulating blood and carried up to the heart and back again through the arterial system to the pelvis, and as the distance from the stomach to the heart is less than from the rectum to the heart, it follows that physiologically the stomach is nearer to the bladder. Moreover, were it possible for the morphine of an opium suppository to penetrate the layers of mucous membrane, connective tissue and muscle which separate the interior of the rectum from that of the bladder, it would have no effect on the latter organ, for the anodyne action of morphine, as of the other alkaloids of opium, is purely central. An opium suppository relieves the pain of a pelvic inflammation in the same way that a hypodermic injection of morphine does, by being carried to the brain and numbing the perceptive centers.

CONCLUSIONS.

I have considered in some detail the fallacies of a few common practices not because they are the only, or even the worst, examples of the lack of judicial spirit in therapeutics, but merely to illustrate by concrete illustrations how inadequate is the data to justify the use of some popular drugs. It would only weary the reader and serve no useful purpose to trace the history of such remedies as chimaphila, cypripedium, taraxacum, eupatorium, scutellaria, xanthoxylum, wild cherry, cactus, and a host of other contributions of the Thompsonians and the American Indians to our materia medica. I should like to emphasize, in closing, the explanation of the origin and survival of these practices. Man, despite his education, is still a superstitious animal. Two or three years ago a well known psychologist made a poll of the faculty of Harvard University and found that a majority of these men, representing the highest type

of intellectual development, were willing to confess to a more or less profound belief in some pet superstition as foolish as the old notion of a black cat or a broken mirror as the harbinger of misfortune. If a patient with pneumonia recovers when we sprinkle the bed with sawdust why not sprinkle the beds of all pneumonia patients? When we combine apiol with ergot and the menorrhagia ceases shall we not attribute mystical synergistic powers to the apiol?

Herein lies one reason for the survival of many of these therapeutic superstitions, namely the simultaneous exhibition of inert and potent drugs and then assuming that the diluent has played some part in the effects. The so-called Towns treatment for the morphine habit includes a mixture of hyoscyamus, belladonna and xanthoxylum; but dare anyone with any knowledge of pharmacology attribute any part in the results of this concoction to the fluidextract of prickly ash? A host of these vegetable "simples" owe their reputation to the fact that they are almost universally exhibited with some real remedy.

Another group of drugs owes its vogue to the exploitation by manufacturers of proprietary preparations. When day after day, from glowing blotters on our desk, from pages in our medical journals, in blackest type, glares out boldly the statement that so-and-so's extract of viburnum cures amenorrhea or that somebody else's elixir of euphorbia cures bronchitis, it is a man of more than ordinary intellectual firmness who will not come to believe it. Few men realize how potent is suggestion, or how many of their beliefs are based on the dogmatic assertions of others, rather than on reason.

It is well that all physicians should from time to time analyze the reasons for the therapeutic faith that is within them. Especially searching should be the self-examination of those who are looked up to by their confrères or pupils as authorities, and unflinching should be their determination to recommend no measure of whose utility they cannot give material evidence, either scientific or empiric.

COÖPERATION BETWEEN PHARMACOLOGY AND
THERAPEUTICS.¹

BY ALBION WALTER HEWLETT, M.D.

SAN FRANCISCO.

It is important that a healthy coöperation should exist between those who are engaged in the scientific study of drug action and those who use drugs for the purpose of curing or alleviating disease; for the problems of pharmacology, like those of pathology, have a very immediate bearing on medical practice. Established modes of treatment frequently form the starting point of scientific studies, and the exact knowledge thus gained leads in turn to greater precision in treatment. Pharmacologic studies have uncovered new therapeutic possibilities that have ultimately proved useful in the clinic. Finally, a clear recognition of the fact that substances of similar chemical structure frequently possess pharmacologic properties that are similar but not identical has opened up a vast field of research. Numerous compounds of a given type are now produced with comparative ease by the organic chemist. While many or most of these may possess no great practical advantage over their original prototypes, yet such studies are constantly leading to improvements in our remedies, and the possibility is always present that the systematic combination of chemical and pharmacologic research will tap important fields that have hardly been suspected hitherto.

Now more than ever before, therapeutic advance depends on an intelligent utilization of the methods, the criticisms and the new discoveries of pharmacology. Older remedies are being restudied, and from the host of newer ones that are constantly being placed before the profession an intelligent choice must be made. Before I undertake to discuss how coöperation between the pharmacologist and therapist may be promoted, however, it may be well to point out some of the factors which tend to separate these two classes of workers. In the first place, their attitudes toward their respective problems are essentially different. The pharmacologist contem-

¹ Chairman's address, read before the Section on Pharmacology and Therapeutics at the Sixty-eighth Annual Session of the American Medical Association, New York, June, 1917. Reprinted from the *Journal of the American Medical Association*, October 6, 1917.

plates with scientific skepticism that which is unproved, and he proceeds slowly and carefully from the known to the unknown. The therapist, on the other hand, brought face to face with a crisis in the life of his patient, cannot refuse to try the unproved when remedies of known efficacy are lacking. Hence he often grasps at straws, being restrained only by the possibility of doing harm to his patient. Such a practice, justifiable in itself, too often leads to those habits of inaccurate reasoning that are reflected in therapeutic literature. Optimism in practice often means an unjustified and uncritical enthusiasm in the interpretation of results.

The pharmacologist and the therapist are further separated by the conditions under which their observations are commonly made. In the laboratory the action of drugs is usually studied on normal animals, and toxic doses can be administered with impunity. In the clinic, on the other hand, therapeutic doses alone are used, and the effects of these are often modified by disease. The pharmacologist is permitted to employ methods of study which involve operative or other harmful procedures. The clinician is restricted to those methods of study that can be used without harm to his patient. Finally, the laboratory worker plans a series of experiments, and he endeavors to eliminate errors by repetition and by controlling the various factors that might influence his results. In therapeutics the number of observations is necessarily limited by the available clinical material, and the interpretation of results is often hampered by the fact that the effects of other factors, such as the natural course of the disease and the action of the other drugs used, is difficult to estimate and is, indeed, often estimated incorrectly. Under such conditions, years may elapse before even a simple therapeutic problem is conclusively answered.

As I have said, pharmacologic studies are usually made on normal animals. In seeking to utilize the knowledge thus obtained for therapeutic purposes, the following questions arise: (1) Are the effects observed produced by doses that can safely and easily be administered to patients? (2) Will the human organism react in the same manner as the animal studied? (3) How is this reaction modified by disease?

The question of dosage, simple as it may seem, has caused and will probably continue to cause occasional therapeutic stumbles. The fact that large doses of strychnine were known to produce a marked rise of arterial pressure in animal experiments was in part respon-

sible for its extensive use by clinicians in conditions of low pressure. Yet it now seems established that in safe doses strychnine does not raise the blood pressure materially, either in man or in animals. The rise of pressure, therefore, is a toxic effect; and, so far as we know, it is not available for therapeutic purposes. Due consideration must also be given to the fact that in the laboratory intravenous injections are frequently used, whereas in medical practice these are seldom given except in emergencies. Finally, different species of animals may vary in their reactions to a given drug. When the reaction is essentially the same in a variety of mammals, it may be assumed that the human organism will respond in a similar manner; but when the reaction varies, the effect on man cannot safely be predicted from laboratory studies. In practice, moreover, even lesser quantitative variations in response may become of paramount importance, for it is our purpose to secure therapeutic results, and at the same time to avoid unpleasant side effects.

One of the most important methods for helping to bridge over the gap between animal pharmacology and practical therapeutics is the accurate study of the effects produced when drugs are given in the usual medicinal doses to human beings. The methods employed in making such studies must naturally be free from the possibility of doing harm. Fortunately a great variety of new methods have been developed in recent years which may be applied to the study of human functions. Without attempting to name all of these, I mention the following: bloodless determinations of the arterial and venous pressures; graphic records of the gastric contractions, of the arterial and venous pulse waves and of the electric changes accompanying cardiac activity; roentgenographic examinations of the alimentary tract; determinations of the rate of metabolism; chemical analyses of the alveolar air, of small quantities of blood and of excreta, and estimations of the various immune bodies in the blood. Each new method that can be applied to the study of human functions not only advances our knowledge of these functions and of their perversions in disease, but also makes possible more accurate studies on how these functions are influenced by various remedial measures. In many cases such studies can be carried out on normal individuals, and within a short space of time sufficient data can be accumulated to establish with scientific accuracy certain aspects of drug action.

Ultimately, however, we must answer the question: Are these

drug effects of value in combating the disturbances of functions that are encountered in disease? The final answer to this question can seldom if ever be given from studies either on normal animals or on normal men. In certain instances the diseased function is unusually susceptible to drug action. The body temperature of a febrile patient, for example, is reduced more easily by antipyretic drugs than is the body temperature of a normal person. Digitalis in therapeutic doses has relatively little effect on the heart rate when this is controlled in the usual way from the sinus region. Its reputation for slowing the heart of patients is based almost exclusively on observations which were made on those suffering from auricular fibrillation. Diuretics of the caffein group produce a moderate diuresis in the healthy man, and may be ineffective or harmful in nephritic edema, whereas in cardiac edema they often cause a veritable flood of urine. The dilatation of the bronchi produced by epinephrin is most plainly demonstrable in conditions of bronchial constriction, whether produced experimentally or occurring during asthma. Finally, the treatment of infections can manifestly be tested only on infected animals or human beings.

Not infrequently the remark is made that the value of a therapeutic measure is determined solely by clinical experience. While I have no desire to contradict this assertion, it should be pointed out that ordinary clinical observations are often extremely difficult to interpret, owing to the vagaries of disease and to the many remedies that are so commonly employed in a single case. The past history of therapeutics warns us that in order to avoid error we need as much assistance as possible from every source. Pharmacology may not, indeed, answer therapeutic problems directly, but at least it aids in their solution. It shows how drug action may be made the subject of accurate study, and the critical attitude which it adopts must be carried over into the interpretation of therapeutic results, if progress in that subject is to be placed on a firm foundation.

On the other hand, pharmacologists could, I believe, be of greater help to those who work in the clinic if they would fully realize how their results may be given a form more suited to clinical needs. What, for example, is the effect of a given drug in small doses, especially when given over a long period of time? How are the effects modified when animals have been made the subject of disease? What pharmacologic problems can be studied on man himself, and especially on patients who are taking the treatment usually

given for their disease? Work on such lines as these, whether by pharmacologists or by clinicians, will help to maintain contact between the science of drug action and the art of treatment.

NOTES ON THE THIRD ANNUAL EXPOSITION OF
CHEMICAL INDUSTRIES, HELD IN NEW YORK
SEPTEMBER 24-29, 1917.

BY SAMUEL P. SADTLER, PH.D.

The idea of a special exposition to show the condition and possibilities of distinctively American chemical industries was first taken up in 1915, shortly after the general realization had come that because of the world-war we were cut off from European supplies and that we must take hold where necessary and provide chemicals for ourselves. It is not necessary now to review the conditions that existed in the beginning of the year 1915. Suffice it to say that not only the users of dyes and synthetic medical preparations and the manufacturers of fertilizers had already realized that their supplies were cut off for an indefinite period but, on patriotic grounds, manufacturers had determined to make an immediate effort to build up a distinctively American chemical industry on broad foundations.

How they have succeeded in this praiseworthy effort, these three successive Exhibitions of 1915, 1916 and 1917 have shown. Not only has the number of exhibitors and space taken increased year by year until three floors of the Grand Central Palace building were filled this September, but the comprehensiveness and quality of the exhibits increased in a notable degree. In this connection, it was stated by Dr. Herty, the chairman of the advisory exhibition committee, that "up to September, 1917, the new capital invested in the varied branches of chemical endeavor in the United States increased the total investment at the opening of the war by nearly \$231,000,000," and it was also stated that the total output of 46 American manufacturers of coal-tar dyes now approximates 60,000,000 pounds a year and that more than \$12,000,000 worth was exported during the fiscal year ending June 30, 1917.

We shall briefly note a few items of interest that a visit of several days to the recent exposition brought to our attention. The won-

derfully rapid development of an American dye-color industry is perhaps the most striking feature illustrated by these successive expositions. Within the past year several of the most important of the American dye-color works have been united under the name of "The National Aniline & Chemical Co., Inc." This combination includes the Schoellkopf Aniline & Chemical Works of Buffalo, N. Y., the W. Beckers Aniline & Chemical Works of Brooklyn, N. Y., The National Aniline & Chemical Co. of New York, the Benzol Products Co. of Marcus Hook, Pa., and the Standard Aniline Products, Inc., of Wappingers Falls, N. Y., together with certain plants and properties of the General Chemical Co., the Barrett Co. and the Semet-Solvay Co. With these has also been incorporated most recently the Cassella Color Co. (American branch) who have, under the name of the Century Color Corporation, taken over the selling agency of the whole combination. The exhibit was a collective one as far as the dye-colors are concerned, and was a most impressive one. Almost the whole range of standard coal-tar dyes was represented, as well as a long list of so-called "intermediates" and many organic chemicals and drugs available for the pharmaceutical profession and the synthetic perfume industry.

There were quite a number of other manufacturers and dealers in intermediates and raw materials of the dye-color, the perfume and the pharmaceutical industries.

The way in which American chemists and manufacturers have responded to the needs of war-time is also shown in the way in which chemical glassware and porcelain ware of superior quality, equal to the best Jena glass or the best Berlin porcelain, are now offered. Whitall-Tatum Glass Co. and the Macbeth-Evans Glass Co. were among the most prominent of the glass supply firms, while the Ohio Pottery Co. and the Coors Chemical Porcelain Co. of Colorado supplied the porcelain. For the general equipment of the chemical manufacturer with specially designed apparatus, can be mentioned the Buffalo Foundry and Machine Co., which had the largest and most striking single exhibit, showing fusion kettles, nitrators, vacuum dryers, evaporators, etc.; the J. P. Devine Co., the Bethlehem Foundry & Machine Co., the Walter E. Lummus Co., the Swenson Evaporator Co., and the United Lead Co. For special lines of apparatus, instructive exhibits were also shown as the pyrometers of the Brown Instrument Co. and the Bristol Co., and the centrifugal separators of the De Laval Separator Co. and the Sharp-

less Specialty Co., both of which concerns have now adapted the centrifugal separating principle to the clarifying and filtering of oils with marked success.

Filter presses and filtering media (of silica, etc.) were also shown in very great variety by the United Filters Corporation, the General Filtration Co., Inc., the Industrial Filtration Corporation, the Celite Co. and others. Fused silica or quartzware for the laboratory and factory were shown in great variety by the Hanovia Chemical & Manufacturing Co. and the Sidio Co. of America.

One of the most interesting exhibits and one which points out the way for great industrial results was that of the Research Corporation, which has the applications of the Cottrell electrical precipitation in hand. This process has already been applied very extensively by the great smelter plants to collect and recover values from their fumes. The most recent application is by cement works and iron blast furnaces for the recovery of the potash salts heretofore lost with their waste gases.

The United States Smelting Co. had an interesting exhibit from their Perth Amboy plant, and showed among other things gold, platinum, palladium, selenium and tellurium recovered from the anode slimes of the electrolytic copper production. Both the vitreous, the amorphous and the crystalline varieties of selenium were shown, the first named in large blocks of a beautiful luster. Tellurium was shown in large masses of a crystalline structure resembling antimony.

The Foote Mineral Co., Inc., of Philadelphia, had a very interesting and striking exhibit of rare minerals and the products extracted therefrom. Many of these have been hitherto considered as of great rarity and are now for the first time shown in quantity.

The Takamine Laboratory, Inc., showed a new product of great interest to the textile trade. It is called "Polyzime" and is a new, powerful, enzymic product of Japanese origin. It is said to be strongly diastatic, as it solubilizes, dextrinizes and saccharifies starches; it is proteoclastic, as it digests or reduces various protein matters such as gluten, sericin in silk, pectin, milk, etc. It is specially prepared for de-gumming and de-sizing purposes in the textile trade.

Very instructive exhibits of a specially pharmaceutical character were also shown by Merck & Co., E. R. Squibb & Sons, and the Monsanto Chemical Co.

Much more of interest was shown, but the underlying element of value was the demonstration of the rapid strides that the American chemical industry is now making.

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

A NEW PROCESS FOR CARREL-DAKIN SOLUTION.—Dr. Alexis Carrel, in conjunction with Dr. H. D. Dakin, has evolved a comparatively new and revolutionary method for treating infected wounds, using a definite hypochlorite solution. The method for the preparation of this so-called Dakin Solution was worked out by G. Ornstein for the Electro-Bleaching Gas Co. The method consists in enclosing liquid chlorine in quantities of exactly 5 Gm. in glass tubes, sealed at one end, of 8 to 9 Mm. outside diameter and 8 to 9 in. long and then sealing the other end of the tube by drawing it out to a point. All of these tubes before they are allowed to go out of the laboratory are tested under increased pressure by heating them to a temperature of 75° C., which raises the pressure of the liquid chlorine from a pressure at ordinary temperatures of 80 to 90 lbs. to over 350 lbs. per sq. in. The glass tubes will stand this immense pressure although their walls are only $\frac{1}{2}$ to $\frac{3}{4}$ Mm. thick. The method of breaking the ampoule with liquid chlorine in the alkali solution has been recently improved by a simple device. The glass bottle in which the solution is prepared is now closed by a rubber stopper, to the bottom of which is fastened a short piece of rubber tubing by means of a short piece of glass rod. The ampoule is fastened with its butt in the open end of the rubber tubing so that the pointed end points downward, and the ampoule is suspended pendulum-like in the bottle containing the alkali solution. The Electro-Bleaching Gas Co. has recently completed arrangements with the pharmaceutical firm of Johnson & Johnson, New Brunswick, N. J., for the marketing of this new development in the liquid chlorine field. —(From *The Journal of Industrial and Engineering Chemistry*.)

ACONITE ROOT SUBSTITUTE.—Examination of samples of aconite obtained in import and interstate trade has disclosed that aconites not recognized in the United States Pharmacopœia, especially "Japanese

aconite" (*Aconitum fisheri* Reich.), have been substituted in some instances for the official aconite (*Aconitum napellus* L.). This substitute is not official in the United States Pharmacopœia and, as far as this bureau is informed, is not official in the pharmacopœia of any other country. These substitutes do not contain aconitine, but other alkaloids, Aconites obtained from species other than *Aconitum napellus* should be labeled so as to indicate the geographical source, and, preferably, also the botanical source, with the additional statement, "Not recognized in the U. S. P.," and should not be used in any of the pharmaceutical preparations of aconite official in the Pharmacopœia.

It may be pointed out that Japanese aconite usually consists of mother (with stem bases) and daughter tubers (with buds), which may be distinguished from those of the official aconite, *Aconitum napellus*, by their much smaller size and weight, less wrinkled and not twisted appearance, more or less short conical shape, generally more mealy condition due to starch, and microscopically by the different arrangement of the fibro-vascular bundles, which is usually not so markedly star shaped. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

ARNICA FLOWERS SUBSTITUTE.—Examination of samples imported as "arnica flowers" has disclosed that *Inula britannica* L. has been substituted in some instances for *Arnica montana* L. This substitute is not official in the United States Pharmacopœia and, so far as the bureau is informed, is not official in the pharmacopœia of any other country. Since *Arnica montana* contains active principles which are not found in *Inula britannica* L., the latter is not a proper substitute for *Arnica montana*. The department will recommend the exclusion from the United States of importations of any products offered for entry as "arnica flowers," but found to consist wholly or in part of flowers of *Inula britannica* L.

The striking differences between the authentic product and the adulterant are that in the adulterant the length of the young achene (undeveloped fruit) is very much shorter, about 1 millimeter long, while it is from 5 to 7 millimeters in the genuine product. The ligulate (ray) flowers are also considerably smaller in length and width than those of the true arnica flowers. The veins number four in the ligulate (ray) flowers of *Inula britannica* L., while 10 have been observed in those of arnica and 7 to 12 are reported in the literature.

The receptacle (the enlarged end of the flowering stalk) is smooth in the flowers of *Inula britannica* L., but hairy in true arnica flowers. There is an abundance of hairlike structures of certain flower parts developed in both species, which are the cause of a somewhat similar appearance of the products. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

BELLADONNA LEAVES SUBSTITUTE.—Examination of samples of importations of "belladonna leaves" has disclosed that *Solanum nigrum* L. has been substituted in some instances for the true material. Since this species contains alkaloids other than those present in the genuine belladonna (*Atropa belladonna* L.), official in the United States Pharmacopœia, the department will recommend the exclusion from the United States of any shipment labeled "Belladonna leaves" but consisting wholly or in part of *Solanum nigrum*. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

BUCHU LEAVES SUBSTITUTE.—Attention is called to the fact that samples labeled as "long," "short," and "oval" buchu leaves and offered in the trade have been found to be obtained from species not official in the United States Pharmacopœia. The "long buchu" proved to be *Empleurum serratulatum* Sol. et Ait., the "short buchu" was identified as *Barosma pulchellum* Bartling and Wendland, and the "oval buchu" was identified as *Barosma crenulata* Hook, var. *latifolia*. The sizes of the leaves are distinctly different from those of the two official species, *Barosma betulina* (Thunberg) Bartling and Wendland, and *Barosma serratifolia* (Curtis) Willdenow, given in the Pharmacopœia. The flavor also of the three adulterants, especially that of *Empleurum serratulatum* and *Barosma pulchellum*, is markedly different from that of the official species.

Material obtained from the above-mentioned unofficial species should not be used in official preparations, and the department will recommend the exclusion from the United States of shipments of any such material unless properly labeled. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

DANDELION ROOT OF INFERIOR QUALITY.—Examination of samples from a recent importation of dandelion root, *Taraxacum officinale* Weber, disclosed the presence of about 40 per cent. of

roots which were badly discolored inside and did not show a porous, pale yellow wood, as required by the United States Pharmacopœia, IX, 1916. The appearance suggested that the material had been improperly dried. This fact was confirmed by microscopic examination showing swollen brownish-yellow masses, indicating that the inulin masses had been partially hydrolyzed and caramelized. The department will recommend the exclusion from the United States of any importation of dandelion root which upon examination is found to contain more than 15 per cent. of dead roots and roots that are more than slightly discolored as a result of improper drying. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

HOREHOUND SUBSTITUTE.—Examination of samples of importations of so-called "horehound" has disclosed that the material in some instances consisted of *Ballota hirsuta* Benth, instead of *Marubium vulgare* L. Material obtained from *Ballota hirsuta* should not be labeled or sold as and for horehound nor used as a substitute therefore. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

MUSTARD SEED STANDARD AND ASSAY METHOD.—Mustard seed is the ripe seed of *Sinapis alba* L. (white mustard), *Brassica nigra* (L.) Koch (black mustard), *Brassica juncea* Hook. f. et Th. or the varieties or closely related species of the types of *Brassica nigra* and *Brassica juncea* Hook. f. et Th., e. g., *Brassica cernua* Thunb., containing not more than 5 per cent. of other seeds or other foreign matter and yields not more than 5 per cent. of total ash nor more than 1.5 per cent. of ash insoluble in hydrochloric acid. Mustard seed, except that obtained from *Sinapis alba* L., yields a volatile oil similar in character and composition to the volatile oils yielded by the above-mentioned species, and when assayed by the method outlined below the yield of volatile oil is not less than 0.6 per cent., calculated as allylisothiocyanate:

METHOD FOR THE DETERMINATION OF VOLATILE OIL IN MUSTARD SEED.

Place 5 grams of the ground seed (No. 20 powder) in a 200-mil flask, add 100 mls of water, stopper tightly, and macerate for two hours at about 37° C. Then add 20 mls of U. S. P. alcohol (95 per cent.), and distill about 60 mls into a 100-mil volumetric flask containing 10 mls of 10 per cent. ammonium hydroxid solution, taking care that the tip of the condenser dips below the

surface of the ammonium hydroxid solution. Add 20 mils of 0.1 N silver nitrate solution to the distillate, set aside over night, heat to boiling on a water bath (in order to agglomerate the silver sulphid), cool, make up to 100 mils with water, and filter. Acidify 50 mils of the filtrate with about 5 mils of concentrated nitric acid and titrate with 0.1 N ammonium thiocyanate, using 5 mils of 10 per cent. ferric ammonium sulphate solution for an indicator. Each mil of 0.1 N silver nitrate consumed equals 0.004956 grain of allyliso-thiocyanate. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

STRAMONIUM LEAVES SUBSTITUTE.—Examination of samples of importations of "stramonium leaves" has disclosed that *Xanthium strumarium* L. has been substituted in some instances for the true material. The examination further showed the absence of the alkaloids characteristic of the drug of the genuine stramonium leaves, *Datura stramonium* L., official in the United States Pharmacopœia. The department will recommend the exclusion from the United States of any shipment labeled "stramonium leaves" but consisting wholly or in part of *Xanthium strumarium*. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

PHILADELPHIA COLLEGE OF PHARMACY.

MINUTES OF THE SEMI-ANNUAL MEETING.

The semi-annual meeting of the Philadelphia College of Pharmacy was held September 24, 1917, at 4 P. M. The President, Howard B. French, presiding. The minutes of the quarterly meeting held June 25 were read and approved. The minutes of the Board of Trustees for June were read by the Registrar, J. S. Beetem, and approved.

The report of the Committee on Nominations was read and ordered entered and filed. Mr. George M. Beringer for the delegates to the Conference of Pharmaceutical Faculties held at Indianapolis, August, 1917, reported verbally. President Lyman's address was of great interest; higher standards for pharmacy were largely dwelt upon. Four years' high-school course was made a requirement for college entrance from 1923. The Conference suggested that teachers in colleges of pharmacy should be required to carry on a certain amount of research work and to prepare one or two papers each

year on subjects of interest to pharmacy. It was also urged that endowments were necessary for the future prosperity of colleges of pharmacy.

Mr. Beringer also reported verbally (in the absence of other members of the delegation) for the meeting of the American Pharmaceutical Association. An extended report of this meeting is published in the *AMERICAN JOURNAL OF PHARMACY* for October, 1917, pages 472-484.

Professor Samuel P. Sadtler, for the Committee on Publication, reported verbally that, owing to the resignation of Professor Henry Kraemer, it was necessary to provide for the position of Editor, and that George M. Beringer had been appointed Editor, *pro tem*.

Election of Trustees: Messrs. J. M. Baer, H. W. Youngken and Mitchell Bernstein were appointed tellers. Previous to the ballot being taken Mr. C. Stanley French, of the Committee on Nominations, read letters from C. Mahlon Kline and Walter V. Smith requesting that their names be withdrawn as candidates for Trustees. While the tellers were counting the ballot Mr. French stated that during the summer a large quantity of material had been received from the Medico-Chirurgical College that will be of great value to our College. Also during the summer some changes had been made in the building; large new blackboards, new cases, new bulletin boards and other additions had been made.

As a result of the ballot the tellers reported the election of George M. Beringer, Joseph W. England and Josiah C. Peacock to membership in the Board of Trustees for the ensuing three years.

The President appointed the Committee on Membership as follows: Freeman P. Stroup, Chairman, Otto W. Osterlund, Richard H. Lackey, with the Treasurer and Secretary, *ex officio*.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE MEETING, BOARD OF TRUSTEES.

June 5, 1917.

Professor Freeman P. Stroup was elected Professor of General Chemistry, and Professor J. W. Sturmer was elected Professor of Pharmaceutical Chemistry.

Bachelor of Pharmacy (Phar.B.) was the title of the degree agreed upon for the new third-year course. It was also agreed that no store experience be required for this degree.

Committee on Examinations recommended that the degree of B.Sc. (in Pharmacy) be given to Louis Gershenfeld, P.D., at the next commencement. It was so ordered.

Committee on Commencement recommended that the usual vote of thanks be extended to those who had rendered services in connection with Commencement week exercises. It was so ordered.

Special Committee on Resolutions. Mr. French read a copy of a letter sent to President Wilson in relation to pharmacy students being drafted for military service, and also the reply of General Crowder, defining the present status of pharmacists in the Army and Navy.

On motion of Mr. Rumsey, the Treasurer was authorized to pay salaries and bills during the recess of the Board.

CORRESPONDENCE.

NATIONAL ASSOCIATION BOARDS OF PHARMACY.

CHICAGO, ILLINOIS, October 4, 1917.

EDITOR AMERICAN JOURNAL OF PHARMACY,
PHILADELPHIA, PA.

Dear Sir: It might be of interest to many of your readers to know that the great state of Pennsylvania is now a full fledged *active* member state of the National Association of Boards of Pharmacy, with reciprocity for pharmacists of that state with 39 other states. In order to be eligible for reciprocal registration in other states, registration must have been on the basis of examination before the Pennsylvania Board of Pharmacy with certain grades, etc. (Registration on college diploma does not entitle the holder to *reciprocity*.)

Forty states now hold *active* membership in the National Association of Boards of Pharmacy, between which reciprocity for full registered pharmacists (licentiates) is in force, provided that registration of applicants for reciprocity must have been by examination before the State Board of Pharmacy in the *active* member state from which they come. Certificates of registration obtained under state laws *without examination*, or on the basis of college of pharmacy diploma *without examination* before boards of pharmacy, do *not* entitle holders to reciprocity.

List of *active* member states follows: Alabama, Arizona, Arkansas, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oklahoma, Oregon, Pennsylvania, South Carolina,

South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, West Virginia, Wisconsin.

Full information may be had by addressing this office.

Very truly yours,

H. C. CHRISTENSEN,
Secy. N. A. B. P.

BOOK REVIEWS.

HAND BOOK OF PHARMACOGNOSY, by Otto H. Wall, M.D., Ph.G. Fourth Edition. St. Louis: C. V. Mosby Company, 1917. 629 pages.

According to the author, the object of this book is mainly to serve as notes on pharmacognosy for students in colleges of pharmacy, for students preparing for State Board of Pharmacy examinations and for everyday exigencies of the retail pharmacist.

The following subjects are treated: Fundamental Studies; Special Studies; Classifications; Method of Study and Animal and Vegetable Drugs, which are treated in 86 groups.

The author discussed the relative merits of the alphabetical, botanical, therapeutic, physiologic and therapeutic combined, organoleptic and physical classifications of drugs, and places most confidence in the classification based upon physical characteristics. In fact, this is the classification adopted for the treatment of drugs which follows.

There are many points in favor of this viewpoint although the writer has found the use of a system based partly upon natural relationship as far as possible and partly upon physical characteristics of drugs to be productive of more interest on the part of the student.

In this treatment of the various vegetable and animal drugs the author fails to consider drugs in a powdered or granulated condition. This point of view would undoubtedly be correct were all

commerce in drugs restricted to those medicaments in an entire or nearly entire form. However, he fails to take into account that by far the greater number of drugs handled by the average pharmacist are in the powdered or granular form.

The statement is made that the study of powdered drugs is not, strictly speaking, part of pharmacognosy. To this the writer desires to take issue. Can it be possible that a powdered drug is not a commercial form of drug? Is not the consideration of commercial forms of drugs one of the most important phases of pharmacognosy?

The figures of whole crude drugs for the most part are excellent, and will prove very helpful in aiding the student identify the drugs in this condition. The same cannot be said for the illustrations of sections. In few instances have the parts of these been indicated in the figures, and in most cases no mention of histological details characteristic of the sections has been made in the text accompanying them. The experience of many has shown that figures mean very little if not accompanied by proper explanations.

Under the caption, "Fresh Fleshy Fruits," the raspberry is cited as an aggregate or multiple fruit. Since this fruit is the product of the ripening of the many carpels of one flower on their receptacle, it must be solely an aggregate fruit, for a multiple fruit is the product of the ripening of a flower cluster (inflorescence).

Under another caption, vanilla is treated as a pod, while, as a matter of fact, the vanilla fruit is a one-celled capsule formed by the union of three carpellary leaves. Again under the headings *Rhamnus Purshiana* and *Frangula* respectively, the statement is made that each of these barks must be kept for at least one year after collecting, because the fresh bark is too acrid and produces griping. It has been satisfactorily demonstrated, however, that the griping principles of both of these drugs can be destroyed by heating the barks at 100° C. for forty-eight hours.

Moreover, in the consideration of the various kinds of starches no mention is made concerning the range in size of the starch grains. Since the forms of starch grains in many species of plants belonging to the same family are closely similar, it would seem imperative to know the range in size in terms of mikrons for the starch grains discussed in order to aid in distinguishing them from those of other closely allied species.

Finally, it is disappointing to find so little space devoted to the consideration of adulterants of drugs, especially since reports from

the drug trade and state and federal laboratories seem to show an increase in this sort of manipulation from the time that foreign drugs became scarce.

HEBER W. YOUNGKEN.

A CRITICAL REVISION OF THE GENUS *EUCALYPTUS*, by J. H. Maiden, I.S.O., F.R.S., F.L.S., Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney. Published by authority of the Government of the State of New South Wales. William Applegate Gullick, Government Printer, Sydney. Price 2s. 6d. per part.

Vol. III, Parts 9 and 10, and Vol. IV, Part 1, of this voluminous monograph of the genus *Eucalyptus* have now come to hand. The author continues to treat in a most lucid exposition the numerous species of this genus that are indigenous to Australia.

Part 9 presents descriptions, distinctive botanical characters and affinities, territorial range, economic uses, etc., of the following species: *E. Baeuerleni* F.v.M.; *E. scoparia* Maiden; *E. Benthami* Maiden and Cabbage; *E. propinqua* Deane and Maiden; *E. punctata* DC.; *E. Kirtoniana* F.v.M.

Part 10 in the same way covers the following: *E. resinifera* Sm.; *E. pellita* F. v. M.; *E. brachyandra* F. v. M.

Part I of Vol. IV similarly describes *E. tereticornis* Smith; *E. Bancrofti* Maiden, *E. amplifolia* Naudin.

The lithographic illustrations are quite artistic and add materially to the descriptions and are hence of great service to the student of this interesting group of plants and the economic products obtained from these.

Mr. Maiden's work on this genus is a further elaboration and continuation of the *Eucalyptographia* of his predecessor Baron Ferd. v. Mueller, and is destined to be a masterpiece of monographing.

G. M. B.

LATIN FOR PHARMACISTS, by Geo. Howe, Ph.D., Professor of Latin, University of North Carolina, and John Grover Beard, Ph.G., Associate Professor of Pharmacy, University of North Carolina. First edition; octavo, cloth, 134 pages, price \$1.00. Published by P. Blakiston's Son & Co., 1012 Walnut Street, Philadelphia, Pa., 1917.

This book is divided into two parts, the first consisting of nineteen lessons, presenting in progressive arrangement the necessary

instruction in forms and syntax, and according to the authors, excluding everything which, however desirable and helpful, is not of immediate practical use to the pharmacist. At the end of each lesson, there is a double set of exercises, requiring translations into English and into Latin. Several lessons are devoted to the practice of writing and reading prescriptions.

It is pleasing to note the adoption of the English pronunciation in this little volume, as it is the custom of scientists generally to apply the English pronunciation to such Latin terms as are used in scientific nomenclature. Moreover, advanced medical educators have adopted the English pronunciation, and it facilitates matters greatly to have uniformity in Latin pronunciations, as far as the druggist and physician are concerned.

Undoubtedly, the book is intended only as a guide for the minimum Latin course prescribed in the Pharmaceutical Syllabus, and is to be supplemented by classroom work under the direction of the teacher. The authors have succeeded in stripping the subject of everything but absolute essentials in their book, and it should therefore be well received by students and teachers who have only a minimum amount of time to devote to this subject of the pharmaceutical curriculum.

ROBERT P. FISCHELIS.

OBITUARY NOTICES.

The death is announced of Prof. Eduard Buchner, Ph.D., professor of chemistry at Wurzburg, who died from wounds received while serving as major in the German Army near Verdun. Dr. Buchner was distinguished for his work on the chemistry of fermentation, and was the recipient of the Nobel prize for chemistry in 1907.

Prof. Adolf Ritter von Baeyer, professor of chemistry at the University of Munich, honorary member of the A.C.S., and one of Germany's best known organic chemists, died in Germany the latter part of August, at the age of 82. He was distinguished for his work on coal-tar derivatives and dyes, especially that on synthetic indigo and eosin. He was elected as professor at the University of Berlin in 1868, at Strassburg in 1872, going to Munich in 1875. In 1905 he was awarded the Nobel prize for chemistry.

George M. Olcott, a member of the well-known firm Dodge & Olcott, New York, manufacturers and importers of essential oils and perfume products, died on September 14, 1917. Mr. Olcott was prominent in commercial and financial circles for many years.

Professor Charles Caspari, Jr., of Baltimore, Md., died suddenly on Saturday morning, October 13. In addition to being a teacher in the Baltimore College of Pharmacy, Prof. Caspari was, for a long time, the General Secretary of the American Pharmaceutical Association and many of its Annual Proceedings were edited by him.

For some years he has served the State of Maryland as Food and Drug Commissioner. He was preparing to visit his office in the Health Department when the summons of death came. While his friends knew that for some time his health was in a rather precarious condition and that he was a sufferer from a cardiac ailment, his sudden decease was nevertheless a severe shock.

On Tuesday, October 23, a memorial meeting was held in the Chemical Hall of the University of Maryland, and many of his friends gathered to attest their regard and to pay a fitting tribute to one whose life had been mainly spent in the interest of pharmacy.

An appropriate memoir of this eminent American pharmacist will be published in the *AMERICAN JOURNAL OF PHARMACY* at an early date.

THE AMERICAN JOURNAL OF PHARMACY

DECEMBER, 1917

EDITORIAL.

HONORA TUAM PROFESSIONEM.

A friend recently remarked that, "in his opinion, the most important thing for a person's happiness was employment in a congenial occupation." This, likewise, becomes an important factor in determining success.

The selection of a vocation for one's life work is a serious problem confronting each youth and in the decision of this all important question, the young man or young woman should have the advice and guidance of the more mature. Only too often is this, as a parental duty, neglected and the decision is prone to be made by an accidental opening for employment or by haphazard selection without due consideration being given to the physical and mental qualifications and that innate aptness possessed by each normal individual.

Errors in the selection of vocations, misfits in their callings, are everywhere in evidence. To the individual the result from such error is indeed serious and must cause discontent and lack of expected success if not actual failure and these constitute a hindrance to the progress of society. The nation's loss from such misfits, if estimated on a monetary basis, would be an appalling sum. Yet, what has been done by the community, or by state or federal authority to overcome this defect, with its detrimental influence on the national progress? Are our educators alive to the importance of this question? Are those who are directly associated with professional and technical educational institutions giving this subject the needed consideration?

At times, the writer has been pained to note the growing tendency to speak disparagingly of one's own calling. Possibly this can

at least be partly attributed to the misfits publicly venting their discontent and relieving their burden of unhappiness. The major part, however, is attributable to thoughtlessness, to that apish tendency to follow example, to take part in the fad of the moment. This heedlessness, only too often in evidence in public, takes no cognizance of the influence of words.

“Boys flying kites haul in their white-winged birds;
You can't do that way when you're flying words.
Things that we think may sometimes fall back dead;
But God himself can't kill them when they're said.”

At a recent pharmaceutical convention the whole atmosphere for a while seemed to be surcharged with expressions far from complimentary to pharmacy, and conversely not very creditable to the efforts of the educators, some of whom so volubly declaimed against pharmacy, nor to the value of the work of the educational institutions they represented.

How many promising young men have been deterred from entering pharmacy or driven from its ranks by the heedless remarks of those who should, in honor to their profession and likewise their own interests, have lent every effort to the upbuilding of the profession and the enrollment of the best of our youth in its service! As a typical illustration, the day that the writer was initiated into the arts and mysteries of the apothecary shop, he was introduced to a gentleman then quite prominent in the Philadelphia drug trade. How encouraging was the greeting received in the following: “So you are the new boy who expects to become a pharmacist; take my advice; don't do it young man, better go down to the foot of the street and drown yourself in the Delaware River.” Needless to say the advice has not yet been accepted.

Let us frankly admit that pharmacy has its shortcomings and defects. However, is there a single profession of which the same cannot today be truthfully said? The legal profession has its pettifoggers and shysters, medicine its quacks and cult charlatans and the hypocrite has to be deposed from the Church of God. The duty of those who are worthy of the name of leaders in pharmacy is plain; constructively criticize and help in the evolution of pharmacy to a higher plane of professionalism. While holding aloft the ideals of professionalism, refrain from demoralizing the foundation that has already been constructed for our professional edifice. Lend

a helping hand to the druggist who is battling in the slough of commercialism; who, probably from necessity and not choice, is between the upper millstone of the prevailing unethical practice of medicine and the lower one of supplying the drug needs and demands of his environment.

G. M. B.

THE DEPARTMENTS OF THE GOVERNMENT NEED THE ADVICE OF THE DRUG TRADE.

Many of the rules and regulations promulgated by the Federal Departments show *prima facie* a lack of actual knowledge of the industries affected. This is especially true as to the requirements of the drug trade and the prevailing conditions and trade customs under which the supplying of the needs of the inhabitants of the country for medicines and the industries for drug and chemical products has to be carried on.

There is evidenced in many ways that those in authority in the various departments of our government have failed to grasp the importance of the drug and chemical industries and the national necessity for conserving these and encouraging their fullest development. As a necessity of life, medicines must be classified with such other prime necessities as food, fuel and clothing. The conservation of all materials considered as necessities of life or as needed for war and the providing of ample supplies of these for the needs of our country and our allies, has been recognized as a great national problem calling for the advice and aid of the highest scientific experts and of specialists in the various trades and industries. Nevertheless, in the organization of the National Council of Defense, the drug trade, controlling one of the prime necessities of life and of no secondary importance in providing alike for the needs of the army, the navy and of the civilian population, was entirely ignored. Medicine and surgery, *whose functions are the application of drugs in appropriate ways and doses, properly has nothing whatever to do with the real problems at issue here, yet medicine boldly attempts to usurp the functions of pharmacy.*

In the National Drug Trade Conference there is always available for consultation by Congress and the departments a competent committee of gentlemen representing the pharmaceutical and the various drug trade organizations who are thoroughly conversant

with the needs alike of their calling and of the nation. In addition, the several national organizations representing pharmacy have standing committees always ready to give advice or render material assistance if needed.

All of this expert knowledge is available to the government and has been cheerfully proffered. Nevertheless, time after time, the advice, recommendations and suggestions offered by these competent representatives of the drug interests have been ignored and the ipse dixit of some department "desk expert," lacking in the essential practical knowledge or experience, has been accepted instead. It is not to be wondered at that the regulations promulgated under the existing conditions are full of inconsistencies and impracticabilities.

We are not prepared to admit that Congress without departmental mal-advice would have singled out the drug business, already thoroughly disorganized by the abnormal war and trade conditions, for special taxation. We cannot conceive that the law-enacting body would have deliberately violated basic humanitarian principles, by adding enormous price burdens on the medical needs of the suffering. If Congress had accepted proper advice this basic error would have been avoided and other materials less important to life than medicines should have carried this portion of the taxation.

The alcohol tax has been a most vexing question affecting the drug trade and the regulations framed by the Internal Revenue Department are not only confusing but in some respects impracticable and well illustrate the need for trade counsellors. In the War Revenue Act, Congress deliberately provided for non-beverage distilled spirits at a less rate of tax imposed than upon spirits when "used or intended for use as a beverage." It is well known that this action was not in accord with the desire of the Treasury Department, whose experts represented to the congressional committees that "the Department was unable to distinguish between alcohol to be used as a beverage and that for other purposes." The provisions of Section 300 of this Act are in harmony with and further the purposes of the Food Control Act previously enacted. The intent of Congress undoubtedly was to give all legitimate users and manufacturers, of other than beverages or beverage products, requiring pure ethyl alcohol, and who from the nature of their uses or products could not use "denatured alcohol," the right to use "non-beverage alcohol" at the lesser rate of taxation.

Among the uses for non-beverage alcohol that Congress had in mind was the medical uses and such legitimate manufactures as food products, pharmaceuticals and perfumes. The latter was specifically named in a clause providing that the same rate of tax be levied on the alcohol in imported perfumes as was paid on non-beverage alcohol used by the domestic manufacturer.

The regulations as promulgated under the Food Control Act with the approval of the President are simple and provide for the proper labelling of spirits produced for non-beverage purposes after the passage of the Act and the penalizing of violators.

The regulations covering non-beverage alcohol promulgated since by the Treasury Department attempt to cover both of these laws and are complicated and confusing, and, despite the several modifications made in subsequent rulings, these are still far from clear.

Among its other provisions the original Treasury regulation on this subject forbade "the selling or delivery" of non-beverage alcohol "to any person, firm or corporation not qualified as a user or dealer" (*i. e.*, by taking out a permit and filing a bond) "and then only upon delivery by the person so qualified of an application therefor in due form, approved by the collector of the district in which the applicant's place of business is located."

Under the regulations a druggist must qualify by first filing an application in duplicate for a permit and giving bond in duplicate and then can purchase the alcohol only on approval of the collector of the district. The druggist having complied with this regulation cannot sell to the baker or confectioner any of this non-beverage alcohol for cutting the flavors used in their business until they each have gone through the same rigmarole. Moreover, a customer who needs some alcohol for external application to reduce the temperature in a fever-stricken member of his family, must be denied even when a prescription is furnished, unless he likewise has gone through the prescribed rigmarole that will make him also an official user or purchaser.

To meet the strenuous objections of physicians and patients to this radical ruling the *regulations* were modified. The modified Treasury decision 2559 now permits "'pharmacists,' who hold permit and have given bond, to sell non-beverage alcohol either with or without a physician's prescription, to persons who do not hold permits and who have not given bonds under the provisions of Treasury decision 2559, in quantities not exceeding one pint, but not in advance of

orders, provided they first medicate the same in accordance with any one of the formulæ recited."

The denaturants permitted are carbolic acid, formaldehyde, mercuric chloride, lysol and liquor cresolis compound used in the proportion and formulas given. In the formulation of this modification the Department has taken the formulas given in a prior standing regulation for the denaturing of tax-free alcohol for scientific purposes in medical schools and hospitals, in which it is aimed to make the alcohol absolutely unfit for other purposes and in which regulation "the sale is prohibited" of such denatured alcohol. Alcohol so denatured by any of the ten permissible formulæ is totally unfit for the purposes for which non-beverage alcohol is commonly needed, with the possible exception of the uses of the undertaker.

We are compelled to consider such regulations as inconsistent, impracticable and absolutely foreign to the intent of Congress. Their purpose would to be appear to make the procuring and use of non-beverage alcohol so troublesome, that many will be deterred from its legitimate use and compelled to purchase and use beverage alcohol at the higher tax rate.

Regulations should be bona fide efforts to carry out the purpose and intent of the law and not mal fide attempts to demonstrate advance statements of a Department's inability or to nullify the will of Congress.

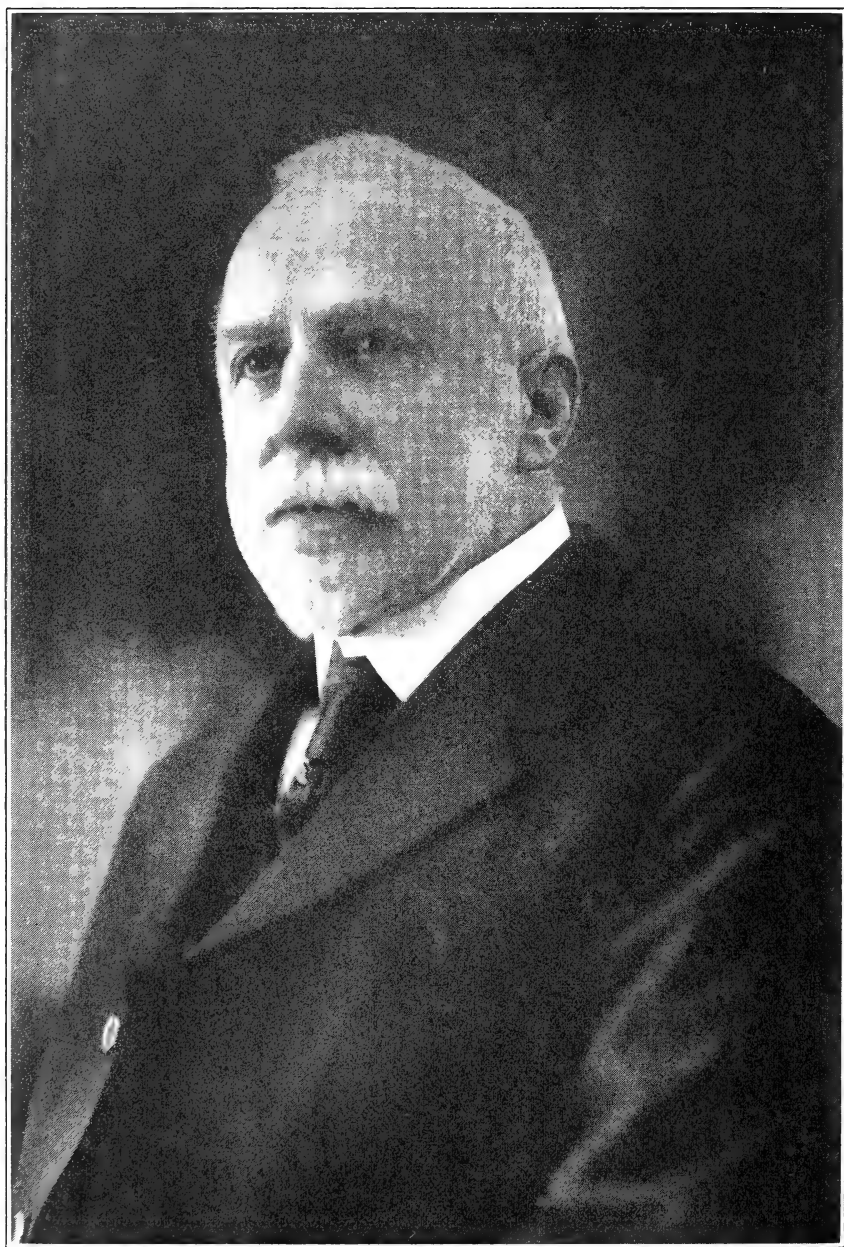
A prime necessity of the time is that the trade interests and the industries should be maintained at their highest efficiency and built up to withstand the strain of unusual conditions and the burden of increased taxation. The immediate collection of a revenue tax is not the sole duty of a department of the government.

G. M. B.

AN OLD TRUTH REDISCOVERED.

In a recent issue our esteemed contemporary, *The Druggists Circular*, announced that "the New York City Health Department had abandoned the Ehrlich Diazo test of urine for typhoid fever," and declared this test "to be useless and of little or no diagnostic value."

In an article published in the *AMERICAN JOURNAL OF PHARMACY*, November, 1892, page 559, the unreliability of this test was pointed out and it was therein stated that "typical reactions were



Chas Caspari Jr.

obtained not only with known typhoid urine, but also in remittent fever and frequently where there were no febrile conditions at all." The article referred to, twenty-five years ago, conclusively proved that very small quantities of peptone, creasote and a number of phenolic or other substances which might occur in urine, either as normal constituents from food ingestion or from medication, produced the reaction claimed by Ehrlich as indicative of typhoid fever.

At that time, the contributor wrote, "I am compelled to question the claims that have been put forth for this test." "While the absence of the reaction may indicate the absence of typhoid, the presence of the reaction would not warrant the diagnosis of typhoid unless supported by other evidence, as many of the products producing the reaction, notably phenol and peptone, may be present in the urine from other causes."

G. M. B.

CHARLES CASPARI, JR.

BY EVANDER F. KELLY, PHAR.D.,
BALTIMORE, MD.

In the death of Charles Caspari, Jr., which occurred at his home in Baltimore on October 13, pharmacy lost one of its most notable exponents, a loss which will not be fully realized until others have attempted to carry on the many-sided activities of this truly remarkable man.

He was the son of Charles Caspari, a pharmacist of ability and reputation who emigrated from Hanover, Germany, to Baltimore in 1848 and conducted at 44 North Gay Street the first German pharmacy in this city until his death in 1870. The mother, whose maiden name was Louise Kleyensteuder, was from Bremen, and to the high ideals, faithful home training and sound preliminary education, which his parents provided, did the son ascribe much of his later success.

Charles Caspari, Jr., was born on May 31, 1850, at 44 North Gay Street and made his home there until after his father's death. His primary education was obtained at the private school conducted by Mr. Scheib, pastor of the Zion German Lutheran Church, in which church he was christened and which was next door to his home. Then he entered the department of arts and sciences of the

University of Maryland, afterwards discontinued but then under the direction of Dr. Dalrymple, an educator noted for his thoroughness, broad scholarship and fidelity to the older ideals in education. The student spent four years in this atmosphere, so like that of his home, and became possessed of that thorough and diversified liberal education which was to be reflected in his own work as author, teacher and editor. Lessons were studied in the forenoon in English, to be repeated on alternate afternoons in German and French. At the age of fifteen this training was completed and he began his pharmaceutical education, the foundation for which his father had so well laid, as an apprentice in the store of Sharp & Dohme. Here he came under the influence of Mr. Louis Dohme, to whose knowledge and ability as a preceptor was attributed much of his detailed and thorough information about pharmacy and chemistry. The preceptor outlined a comprehensive course in theory and practice and gave liberally of his time and advice to see that his apt pupil accomplished every task promptly. He entered the Maryland College of Pharmacy in 1867, graduating in 1869, at the same time completing his apprenticeship, and continued in the employ of Sharp & Dohme.

Upon the death of his father, the son entered the practice of pharmacy as his successor and continued the business until 1875, when he sold it and bought a store at Baltimore Street and Fremont Avenue. Later an interest was also acquired in a store at Harlem Avenue and Carey Street, and he conducted these places of business until 1890, when it became necessary for him to devote his entire time to other interests. In the conduct of his stores, he maintained the high ideals which he professed and gained the full confidence of his customers and of the physicians. During 1876 and 1877, he traveled extensively for Sharp & Dohme.

Dr. Caspari had, in the meantime, entered his true vocation, when in 1879, he succeeded the late J. Faris Moore as professor of the theory and practice of pharmacy in his alma mater, a work he was to continue until the day before his death and to which he gave his full measure of devotion. While his success as a lecturer was immediate, he considered as possibly his greatest contribution to the teaching of pharmacy, the inauguration of a laboratory for instruction in practical pharmacy, the first in this institution. He became dean of the faculty in 1896, and continued as such after the college became the department of pharmacy of the University of

Maryland in 1904, also representing it on the board of regents of the university and on the university council. The university conferred the honorary degree of doctor of pharmacy upon him in 1907 in recognition of his many attainments. During the last three years, he has been lecturer on pharmacy in the Johns Hopkins Medical School.

Dr. Caspari has contributed regularly to the current literature of the profession since his graduation, and yet his ability as an author was not fully recognized until the appearance in 1895 of his "Treatise on Pharmacy," which was only last year revised for the 5th edition, and which is a standard, "preëminently intended to be one of instruction and aid in the study and use of the Pharmacopœia." For years, he has also been the pharmaceutical editor of the National Standard Dispensatory.

As a member of its Committee on Revision, and as a Vice-President of the Pharmacopœial Convention, 1910, Dr. Caspari has done valuable work on the revisions of the Pharmacopœia undertaken in 1890, 1900 and 1910, and was a member of the executive committee of the last as chairman of the subcommittee on nomenclature. He was also a member of the National Formulary Committee for the first and second editions of this work, acting as chairman of the subcommittee on additions in the latter revision.

The success of pharmaceutical and allied associations was of great interest to Dr. Caspari, possibly that of the Maryland Pharmaceutical Association, of which he was one of the organizers in 1882 and a charter member, and the American Pharmaceutical Association, which he joined in 1884, more than others, although he was an active member of the American Medical Association, American Chemical Society and other scientific and professional bodies, and an honorary member of many others. He filled many important offices in his state and national association, but resolutely declined election to their highest office. In the national body, he was elected permanent secretary to succeed Professor Maish in 1894, and in 1896 was made general secretary, which office he resigned in 1911. To the duties of this office and the interests of the association was given possibly his greatest efforts and devotion next to his work as a teacher, and with results which this short memoir could not possibly set forth, but which are not only nationally but internationally appreciated. As an editor of the mass of pharmaceutical literature

which passed through his hands in connection with this office, he set a standard which is a marked tribute to his diversity.

When Maryland adopted a Pure Food and Drugs Law in 1910, Dr. Caspari was turned to as the man to act as the first food and drugs commissioner, to inaugurate the operations of the law and to organize the necessary machinery to carry out its provisions. His work here, so unlike in its scope any other he had undertaken, was an honor to his beloved profession, and he not only protected the public from fraud, but markedly raised the standard of the food and drug products of the state, at the same time gaining the admiration of those concerned for his fairness and impartiality.

Dr. Caspari was interested in all matters of public and individual welfare and most of these interests were known only to his close friends.

His family life was particularly happy. Mrs. Caspari was Miss Leslie V. Heinichen, of Fredericksburg, Va., and it is a great regret to all who have known of their happy life together that Dr. Caspari was not spared to celebrate their golden anniversary. They were married in 1874, and to them were born seven children, five daughters and two sons, six of whom are living.

"Work was the motif of his life," not to gain but to accomplish, and this unflagging industry, with his exceptional training, ripe scholarship, broad experience and natural ability, assured success beyond the usual in all he undertook, and made great impress on all with whom he came into contact, particularly his many students. A virile man, of charm of manner, of true modesty, of innate refinement, of simplicity of life, of obvious honesty in intent and act, who did, to the best of his power, his duty as he saw it, without favor and without claiming infallibility; who was frank, without rancor, and expected equal frankness; he would be the first to acknowledge any such frailties as made him human.

THE POSSIBILITY OF A UNIFICATION OF PHARMACOPŒIAL STANDARDS.¹

BY GEORGE M. BERINGER, A.M., PH.M.

Your honored president, Dr. T. H. Carmichael, my esteemed friend ever since the days of our youth when we were classmates in the Central High School of Philadelphia, invited me to address you on this occasion. His invitation was construed as a friendly command. He generously assigned to me no stated subject and I trust that the topic that I have selected may prove acceptable and, possibly, that the suggestion contained may merit further consideration.

The necessity for uniformity, for standardization, in order to attain the highest efficiency and to obtain the most satisfactory and concordant results is now more fully appreciated than ever before in the history of the world. Today, the demand for standardization is evidenced in every line of human activity; whether we consider the mechanical industries, manufactures, agriculture, arts, education, the professors or any of the sciences, in whatever way the attention is directed, one discerns the same strong current. As human judgment is far from perfect, it must be allowed that some of these efforts at times rather deflect than aid true progress and that, temporarily, normal views have been obscured and real advancements retarded.

When one studies any of the sciences, whose function it is to set in orderly array the truth in the selected line of research and study, he becomes aware how this so-called "modern wave" is after all but a continuation of that desire for higher mental, spiritual or material attainment which was created with the implanting in the human mind of that attitude which we call ambition. Moreover, he is impressed with the truth that idealistic ambitions are never fully realized; that there are some things concealed from man, some things still higher and beyond human reach. Likewise he learns that the ambitious striver for the higher goal is subjected to the suspicion, envy and dislike of fellow men. The poet Byron aptly wrote:

¹ An address delivered before the Homeopathic Medical Society of the County of Philadelphia at the meeting in Hahnemann College, October 11, 1917.

"He who ascends the mountain tops shall find
The loftiest peaks most wrapt in clouds and snow;
He who surpasses or subdues mankind,
Must look down on the hate of those below."

The physician or pharmacist who delves into the history of his profession, and especially that of *materia medica*, discovers how many of the practices of this day and generation are but the reflections of very ancient usages. The prescription and the formula are only some of the means that were adopted to systematize the practice of medicine by the application of standards, definite instructions and rules of procedure. Early Egyptian inscriptions show that the priests of Isis were the pharmacists to whom the physician priests sent their prescriptions to be compounded. Papyrus records containing directions for such prescriptions have been traced back to dates ranging from 1550 to 3300 B.C.

Biblical history, likewise, furnishes some interesting information as to the ancient practices and the uses of drugs among the Israelites. In Exodus we find a detailed account of the ceremonies adopted for the dedication of the temple and the consecration of the priests. In Chapter XXX is given this exact formula for the preparation of the holy anointing oil:

"Take thou also unto thee principal spices, of pure myrrh five hundred shekels, and of sweet cinnamon half so much, even two hundred and fifty shekels, and of sweet calamus two hundred and fifty shekels, and of cassia five hundred shekels, after the shekel of the sanctuary, and of olive oil an hin;

And thou shalt make it an oil of holy ointment, an ointment compounded after the art of the apothecary: it shall be an holy anointing oil."

Again in verses 34 and 35 of the same chapter note the formula for the holy perfume or incense:

"Take thou unto thee sweet spices, stacte, and onycha, and galbanum; these sweet spices with pure frankincense: of each shall there be a like weight:

And thou shalt make it a perfume, a confection after the art of the apothecary, tempered together, pure and holy."

Although these formulas date back to about 1500 B.C., it is noteworthy how typical they are of the modern prescription, not only in the form and language used but also as to the drugs and spices named. An analysis of the wording brings out more forcefully this similarity. These mosaic formulas both start with the word

take, "take thou" and "take unto thee" and the custom still continues in medical practice, as each prescription written has as the initial direction the symbol *R*, an abbreviation of the Latin "Recipe," or "take thou."

The instruction to use only *pure* myrrh and *pure* frankincense and only *sweet* cinnamon and *sweet* calamus can be construed only as an admonition in order to maintain quality and indicates that even in those early days substandards goods were on the market. The specification of the weights and measures to be taken shows, likewise, that the Israelites, following the custom of other nations, had adopted a national standard system of weights and measures and that the lawgiver was impressing the fact that adherence to these standards was essential in order to obtain a uniform product.

Moreover, note the statement "after the art of the apothecary." This proves that, even at that early date, pharmacy was recognized as a distinct calling and the apothecary as a man of skill and learning filling a responsible position in society and that his special knowledge and art was necessary for the proper compounding of medicines. Further, that ointments and confections were well-known forms in which his products were exhibited and likewise that then as now not infrequently he was a perfumer as well as an apothecary.

The XIII Chapter of Leviticus gives directions for the diagnosis of leprosy and the method of differentiating between that disease and other affections of the skin and instructions for the isolation of the unfortunate leper.

These examples serve to show how long the principles of systematic study and of standardizing the practice of medicine by the use of accepted methods and formulas have governed professional medicine. In fact, this is the very basis for our distinction between ethical medical practices and empiricism and quackery.

The necessity for uniformity in medical and pharmaceutical practices has caused each of the civilized nations to prepare a pharmacopœia the standards and formulas of which are the official guides for the important medicines dispensed within the political boundaries of each nation. The need for such accepted standards becomes a recognized necessity in the early history and independent autonomy of each nation.

The Pharmacopœia of the Military Hospital of the United States Army published in Philadelphia in 1778, and intended to supply the needs of the Military Hospital of the Colonial Army then located

at Lititz, Lancaster Co., Pa., is believed to be the first American attempt at such a standardization. The first edition of the United States Pharmacopœia was published in December, 1820. This was the result of discussions of the subject extending over a period of some fifteen years or more which was finally directed into definite action by a paper submitted in January, 1817, by Dr. Lyman Spalding to the Medical Society of the County of New York in which he outlined a project for the formation of a national pharmacopœia. His plan called for a convention of delegates from the medical societies and schools of the United States to be held in the city of Washington. The convention was convened in 1820 and their deliberations were consummated in the first edition of the Pharmacopœia of the United States.

Fortunately, before adjourning this general convention of 1820 arranged for the future revisions of the book by providing that the subsequent pharmacopœial convention should be called together in the same city in 1830. This plan for the regularly convening of delegates in a national pharmacopœial convention in the decimal year has been continued and by this method we have so far had prepared nine decennial revisions of the U. S. P.

The Pharmacopœia of the United States is prepared on a truly democratic plan, differing entirely from the methods in vogue in other countries in which usually a commission is appointed by the government to discharge this national duty. The United States Pharmacopœia is the peer of any of these national authorities and abroad it has been spoken of as "the autocrat of the pharmacopœias." That the American plan of revision is fundamentally sound has been demonstrated by its withstanding the criticisms of nearly a century and likewise by the success that has attended the plan and the acknowledged standing of the resulting work.

The desire for international as well as national harmony of pharmacopœial standards has been a topic receiving the merited consideration of prominent authorities in many countries. The Conference held in Brussels in 1902 and entitled *Conférence Internationale pour l'Unification de la Formule des Médicaments Héroïques* was an important movement with that end in view. The conclusions of this convention as set forth in an international protocol have been very largely adopted in the revisions of the various national pharmacopœias that have appeared since that date. A few of the recommendations made therein have not been universally ac-

cepted and moreover progress in the medical sciences since that time has presented some new problems, so that there is now great need for another international conference on the subject.

The Federal Food and Drugs Act of 1906 named the United States Pharmacopœia and the National Formulary as the legal authorities for drugs and their standards of strength, quality and purity thus became the law for such drugs and formulas as are included in these works. While we had, as the result of the unselfish labors of the revisers of the Pharmacopœia and National Formulary, two standard books that could be recognized as legal authorities for most of the drugs commonly used, it is noteworthy that there were no such standard authorities for the foods consumed and this deficiency has not yet been supplied.

I am well aware that the Federal Food and Drugs Act also failed to provide standards or to designate any published work as the accepted legal authority for purely homeopathic medicines. In my opinion this was an oversight that should have been corrected as a number of homeopathic drugs and preparations are of such extensive use that standards of quality and purity should have been named.

The failure of the efforts of the homeopathic practitioners to secure favorable action by Congress to an amendment of this Act providing for standards for homeopathic medicines is now a matter of history. It is unfortunate for homeopathy that the followers of that school of medicine in the United States are not unanimous in their support of only one authority. Some accept the Homeopathic Pharmacopœia of the United States as their guide, others insist on using the American Homeopathic Pharmacopœia. This difference may have unfavorably influenced Congressional consideration of the proposed amendment to the Act of June 30, 1906, to recognize homeopathic standards.

In the states that by enactments have established legal standards for homeopathic drugs there is a lack of harmony. The Act of the Pennsylvania legislature approved June 7, 1917, in both sections 2 and 3, provides that the American Homeopathic Pharmacopœia shall be the standard of strength, quality or purity for homeopathic drugs sold in that commonwealth and the Food and Drugs Act of the neighboring state of New Jersey names the Homeopathic Pharmacopœia of the United States as the legal authority in that state. These are but examples of the existing conflict of opinions, the

elimination of which would probably aid in securing federal recognition of homeopathic standards.

As the time fixed for the holding of the Pharmacopœial Convention in 1920 is rapidly approaching, it is both opportune and appropriate that changes proposed to be made in the tenth revision should be discussed. The proposition that I present to you now, it must be understood, is upon my own initiative. It has not yet been discussed with any one and must not be construed as being in any way an official proposition emanating from or authorized by the Committee of Revision of the Pharmacopœia.

My thought is that there should be but one American Pharmacopœia and that should be the Pharmacopœia of the United States of America. As the legal authority of this nation, the scope of this work should be so extended and broadened as to supply proper standards for all medicines of known composition or formula that are commonly used by any recognized school or branch of medicine. In just so far as the Pharmacopœia fails in doing this, it fails in discharging its function as a legal authority. In order to fulfill its national obligations its pronouncements cannot be limited to the ideas of any school or cult. If the Pharmacopœia were to fail to meet in a satisfactory manner and to a fair degree the demands of the country and the needs of the government for standards, then its doom as a legal standard would soon be sealed.

There has been a noticeable, even though it has been gradual, coming together of the various recognized schools of medicine and they undoubtedly have much in common in their practices today.

The pharmacopœial convention was originally restricted to delegates from medical societies and medical colleges but with each decennial gathering the representation has been extended so as to include the various departments of the federal service, pharmaceutical societies and schools of pharmacy, and in the recent convention the American Chemical Society, the Association of Official Agricultural Chemists, the Association of State and National Food and Dairy Departments, the National Wholesale Druggists' Association and the National Dental Association were all represented by delegates. As it appears to me there should be no objection to a further extension so as to include the homeopathic medical schools and the homeopathic medical societies of proper standing. There appears to be no valid reason why the homeopaths' requirements for standards could not be covered in the United States Pharmacopœia.

In the ninth revision of the U. S. P., innovations were introduced, such as the chapters on Biological Assays, Sterilization and Diagnostical Reagents and Clinical Tests. It would be no greater innovation for the tenth revision to have chapters such as appear in homeopathic pharmacopœias on the Cleansing of Utensils, Vehicles, Selection of Medicinal Substances, Preparation of Potencies or Dilutions. The various classes of preparations used by the homeopaths, such as triturations, tinctures, solutions, etc., very likely could be treated by general formulas after the plan adopted in the ninth revision of the U. S. P. in fluid extracts and tinctures. A subcommittee on homeopathic standards of the Committee of Revision could readily provide for this part of the revision.

The Homeopathic Pharmacopœia of the United States already gives evidence in a number of its monographs of the desire for a uniformity of standards. Unfortunately some of these references to the U. S. P. are incorrect as they fail to note the changes of the recent revisions. Notable examples of these are seen in the paragraphs on Ferrum Carbonatum, Ferrum Iodatum and Ferrum Muriaticum.

Many changes in the titles and nomenclature used in the homeopathic pharmacopœia would be necessary and the correction of the inaccuracies in the botany and chemistry of the monographs, some of which have already been pointed out,² would be greatly to the advantage of the users of such drugs.

The covering of the needs of homeopathy for legal standards by including such in the U. S. P., I do not believe will present any difficulties that will be insurmountable. If such a merger in its entirety be not at present considered as feasible, then there should at least be a joint harmonizing committee representing the committees of revision of both pharmacopœias and this harmonizing committee should be charged with the duty of providing uniform standards for such drugs and preparations as are commonly used in both schools.

² *Journal of the American Pharmaceutical Association*, Feb., 1915, p. 208.

PHARMACOPŒIAL STANDARD FOR SODIUM
BENZOATE.

BY CARL E. SMITH.

Inquiries of manufacturers and others, in doubt about a correct interpretation of the standards of purity and strength for sodium benzoate, as laid down in the United States Pharmacopœia, 9th revision, have drawn my attention to several instances of vagueness and deficiencies in the specifications of this important drug. These deficiencies have caused honest doubt in the minds of some and have presented a plausible excuse for others to foist an inferior product on an unsuspecting public.

One of the defects, which are doubtless due to oversight, is the failure to state explicitly that the benzoic acid forming part of the salt must conform to the same standard of purity as that required for benzoic acid itself under its own separate heading. Another is the failure to adequately restrict the water content. Still another is the inadequacy of the assay method prescribed.

It seems self-evident that the Revision Committee did not intend to permit an indefinitely lower standard for the sodium salt than for the acid from which it is made. That would have been grossly inconsistent. In the 8th revision of the U. S. P. it was distinctly stated that the acid separated from the salt must "conform to the tests of purity given under *Acidum Benzoicum*."

Much benzoic acid contaminated with excessive quantities of chlorobenzoic acid and other impurities is circulating in this market. As this cannot be sold as benzoic acid U. S. P., much of it is likely to be made into the sodium salt, with the impurities remaining in the product, and disposed of under a lax interpretation of the U. S. P. requirements.

In their own and that of the consuming public, purchasers should therefore demand that the sodium benzoate sold as conforming to the U. S. P. standard should not contain any benzoic acid that is below the U. S. P. standard for that acid.

It is a fact apparently little known outside of the factories making this salt that it can hold a considerable quantity of water without showing it, as much as 11 per cent. The texts of the 8th and 9th revisions of the U. S. P. make no explicit provisions concerning permissible water content and ignore the fact that a hydrated salt

exists, but they lead to the inference that the official salt was intended to contain but little water at most. It can be readily seen that a variation of 11 per cent. in strength is considerably beyond reasonable limits, for commercial reasons as well as for medicinal dosage. The British Pharmacopœia of 1914 requires absence of more than 4 per cent. of water. This a perfectly fair restriction and the U. S. P. should have made a similar specific provision.

Experience has shown that general provisions, such as that rather effectively hidden in the Preface of the U. S. P., permitting 5 per cent. of moisture when no special provisions are made, are very liable to be overlooked by those whose duty it is to pass upon the quality of medicinal products.

The official assay method does not with certainty show whether the salt actually contains the required minimum percentage of benzoic acid. It shows merely how much alkali remains after burning off the organic acid or acids in combination with it and does not necessarily indicate the quantity of benzoate present. A direct determination of the benzoic acid, which is the important constituent, is decidedly preferable for that reason, also because of other sources of error in the method. It would be quite possible to adulterate sodium benzoate scientifically with sodium salts of cheaper organic acids in such manner that the fraud would not be detected by means of the U. S. P. tests alone.

5 BEEKMAN STREET, NEW YORK,
November, 1917.

IODOMETRIC DETERMINATION OF CHLORINE IN CHLORIDES.¹

BY GREGORY TOROSSIAN.

With the object in view of determining chlorine in chlorides quickly and accurately and without the use of silver nitrate, the well-known method for valuation of the available MnO_2 by iodine was applied. In the determination of the available MnO_2 by iodine the sample is treated with a quantity of hydrochloric acid in a small distilling flask, the liberated chlorine is carried through a glass tubing into a solution of potassium iodide and the liberated iodine is titrated

¹ Reprinted from *The Journal of Industrial and Engineering Chemistry*, August, 1917.

with a *N*/10 sodium thiosulphate solution. In the proposed method for the determination of chlorine in chlorides the sample is mixed with finely powdered manganese dioxide, and treated with sulphuric acid (1:1 by vol.) in a distilling apparatus, as in the MnO_2 determination, and the chlorine, produced by the interaction of MnO_2 and the HCl set free from the chloride sample by the action of H_2SO_4 , is conducted into a KI solution and the liberated iodine titrated as usual with *N*/10 $\text{Na}_2\text{S}_2\text{O}_3$. In this reaction between sulphuric acid and a chloride in the presence of MnO_2 , the chlorine from the chloride is all distilled off, the spent liquor showing no chlorine when tested with AgNO_3 . The reaction appears to be:



METHOD.

The Reagents Required.—(1) Finely ground MnO_2 (passing 100-mesh sieve).

(2) Sulphuric acid (1:1 by vol.) free from nitric, hydrochloric acids, nitrates and nitrous fumes, etc.

(3) Potassium iodide solution, 25 grams per liter.

(4) *N*/10 sodium thiosulphate solution.

The Apparatus used is the same as in the case of MnO_2 determination by distillation with hydrochloric acid and is shown in the accompanying sketch.

The Sampling in this method is very important. In the case of solids the sample must be finely powdered to insure intimate mixing with the manganese dioxide. If this is not done, there may occur a loss of chlorine during the operation or incomplete decomposition of the chloride. In the case of liquids the sample must be measured from a burette if percentage of volume is required or weighed in the flask directly without adding any water. The amount of sample to be taken for the analysis varies from 0.12 to 5 Gm., depending on the amount of chlorine present. For liquids, from 0.5 to 5 Cc., or weights corresponding to these figures, are taken.

Procedure.—The weighed sample is thoroughly mixed on the weighing glass with about 2 G. of finely powdered manganese dioxide² and transferred into the round-bottomed flask *A*; 50 Cc. of sulfuric acid (1:1 by vol.) are added and at once the flask is attached to the glass tubing *B*, which is inserted into the larger glass tube *C* containing 100 Cc. of KI solution and surrounded with cold

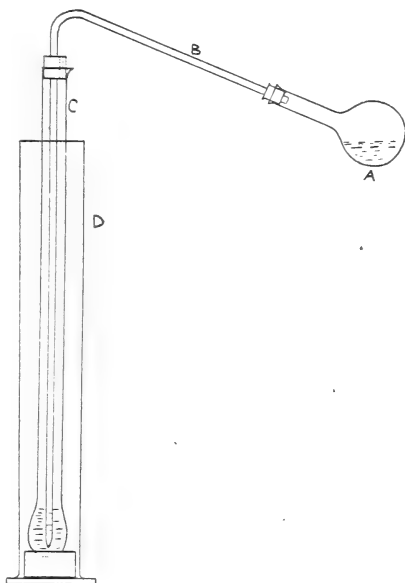
² For larger samples the amount of MnO_2 can be increased.

water in the cylinder *D*. The flask is now slowly heated with a gas burner and constantly agitated, not too strongly, but just enough to keep the contents in motion until boiling. The boiling is intermittently continued, with occasional agitation, for 3 to 5 minutes, when all chlorine is distilled over into the KI solution. The boiling is stopped, the flask quickly removed, and the glass tubing washed, inside and outside, into the main solution, which is transferred into a 600 Cc. pear-shaped flask, then brought to a volume of about 200 Cc. and titrated with a *N*/10 sodium thiosulphate solution previously standardized against pure iodine. One equivalent of iodine is equal to one equivalent of chlorine: 1 Cc. *N*/10 $\text{Na}_2\text{S}_2\text{O}_3 = 0.003546$ Gm. Cl.

When a liquid is to be analyzed, the manganese dioxide is simply added to the sample in the flask.

If the chlorine in fluorides is to be determined the procedure is carried out in the same way as for the other samples. Some HF will be evolved, but it has no effect upon the final results and its action upon the glass is negligible.

If the sulphuric acid is free from nitric and hydrochloric acids, chlorides, nitrates and nitrous fumes, and the manganese dioxide contains no impurities capable of decomposing KI on volatilization, the boiling of the sulphuric acid and MnO_2 for over 8 or 10 minutes does not produce any appreciable coloration in the KI solution. The sulphuric acid may be heated to fuming to drive off HNO_3 , otherwise a blank test can be run and appropriate correction made. The highest blank consumption of *N*/10 $\text{Na}_2\text{S}_2\text{O}_3$ did not run over 0.2 Cc. in the author's experience and this was due to nitric acid found in the sulphuric acid used.



Apparatus for the Determination
of Chlorine in Chlorides
by Distillation.

TABLE I.

*Results by Silver Chloride and by Author's Method.*On Basis of 1 Cc. $\text{Na}_2\text{SO}_3 = 0.0038204$ Gm. Cl.

Material Analyzed.	No.	Per Cent. Chlorine.		
		Calc.	By AgCl.	By I_2 .
Sodium chloride (NaCl)	1	60.66	60.66	60.74
	2	....	....	60.51
	3	....	....	60.91
	4	....	....	70.67
	5	....	....	60.73
	6	....	....	60.87
	7	....	....	60.81
Potassium chloride (KCl)	1	47.56	47.52	47.49
	2	....	....	47.49
	3	....	....	47.49
	4	....	....	47.61
	5	....	....	47.61
	6	....	....	47.51
	7	....	....	47.54
$\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$	....	29.03	28.82	28.95
$\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$	....	41.59	....	41.59
$\text{CuCl}_2 \cdot 2\text{KCl} \cdot 2\text{H}_2\text{O}$	....	44.45	....	44.67
Dry cell mixés	1	....	5.78	5.74
	2	....	5.40	5.49
	3	....	....	....
Chloride liquors (containing Mn, Zn, NH_4 and Ca)	1	....	17.75	17.65
	2	....	13.48	13.04
	3	....	10.92	11.06
Rare earth fluorides	2	....	0.10	0.13
	2	....	0.23	0.24
Manganese ores	1	....	....	0.001
	2	....	....	0.005
	3	....	....	0.002

In Table I are tabulated the results of some determinations of chlorine in chlorides and products containing chlorides by the above method. If values in Table I for sodium chloride, which, by precipitation, gave 60.00 per cent. Cl (the theoretical content); are used for the standardization of the sodium thiosulphate solution, the mean value for 1 Cc. $\text{Na}_2\text{S}_2\text{O}_3$ gives 0.003815 Gm. Cl. and if this value is used to calculate Cl in the potassium chloride (Table I) the following figures are obtained:

Potassium chloride No.:	1	2	3	4	5	6	7	Av.
Per cent. chlorine	47.42	47.41	47.41	47.53	47.54	47.44	47.41	47.46

The figures given in this paper were obtained under the ordinary technical analytical laboratory conditions and no claims of extreme precautions and care are made by the author, but from the results given it is clear that the errors in the determination of chlorine in

chlorides by the iodometric method described above are negligible for most purposes of ordinary laboratory analysis. The sodium thiosulphate solution can be standardized against sodium chloride which previously has been standardized by precipitation with AgNO_3 , and the mean of the three determinations taken as expressing the strength of the $\text{Na}_2\text{S}_3\text{O}_3$ solution, but the standardization against pure resublimed iodine answers the purpose very satisfactorily.

This method of iodometric determination of chlorine in chlorides is a very simple operation, inexpensive and accurate, and exceedingly quick; the entire procedure from weighing of the sample to the titration of the iodine does not consume more than 15 minutes. By this same method HCl in a mixture of hydrochloric and sulphuric acids can easily be determined without any precipitation.

This method also will serve as a quick qualitative test for ascertaining whether a given sample contains chlorine and the possible amount.

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A COMPARISON OF AMERICAN AND ORIENTAL STORAX.¹

BY STROUD JORDAN.

The liquid or semi-liquid balsam obtained from "*Liquidambar styraciflua*," known in the United States as "sweet gum," has been recognized for a long while and samples were shown at the Paris Exposition in 1878. This material resembles liquid storax of the Levant and shows only a slight variation in composition.² It generally occurs in grayish or reddish gray, opaque masses, which harden with age and upon exposure to the air, finally becoming very brittle. The fresh balsam is a clear, yellow-brown, semi-liquid of the consistency of honey and the purified "sweet gum" also exhibits the same characteristics although it is not so fluid as the fresh material. The hardened gum is gathered in certain localities and without further preparation is used as a chewing gum.

¹ Reprinted from *The Journal of Industrial and Engineering Chemistry*, August, 1917.

² U. S. D. 1197, 19th Ed.; Gildemeister and Hoffmann, "Volatile Oils," 1, 136; Watts' "Dictionary of Chemistry," 1 (1874), 496.

Large quantities of liquid storax have been imported from Asia Minor where it is gathered from the "Liquidambar" tree (*Liquidambar Orientale*), but scarcely any imports are received at the present time on account of European conditions. This material is used in pharmaceutical preparations, as a source of cinnamic alcohol and concentrated essence of storax, which are used in perfumery as fixatives, and as a general source of cinnamic acid and its compounds. It is unnecessary to go further into detail since this material is described elsewhere.³

Since the imports of liquid storax have been practically discontinued it has become necessary to look for American sources and this article is simply a comparison of the American and Oriental storax of commerce, dealing with the crude materials as received. The analyses of storax given below were made on samples which were sold on the New York market from 1912 to 1917, showing the gross adulteration of this material. The sample of "sweet gum" analyzed was gathered in Durham County, North Carolina, during March, 1917, and the genuineness of this article can be guaranteed. An average analysis of "sweet gum" is given, which will vary from time to time, according to locality and condition.

METHOD OF ANALYSIS.

The general methods of analysis used are given in "Resins, Balsams and Gum Resins," by K. Dietrick, page 233, 1901.

In addition to the above analysis, the method as outlined in *Chemical Abstracts*, 2 (1908), 2845, for Peruvian balsam, has been followed out in some cases, as a comparison.

RESULTS.

The following values have been obtained from the samples of crude storax and "sweet gum" examined:

No discussion of the storax analyses will be attempted since there is not a first-class sample in the entire lot. It will be sufficient to point out the wide variations, especially in Nos. 2, 11 and 12, which were grossly adulterated with colophony. It will appear, however, that "sweet gum" compares favorably with liquid storax, especially

³ E. J. Parry, "Food and Drugs," p. 492; U. S. D. 1197, 19th Ed.; Gilde-meister and Hoffmann, "Volatile Oils," 1, 136; K. Dieterich, "Resins, Balsams and Gum Resins," p. 225; Watts' "Dictionary of Chemistry," 1 (1874), 497.

ANALYSES OF COMMERCIAL STORAX AND OF "SWEET GUM."

Storax No.	Material.	Volatile Matter.	Ash.	Ether Insoluble.	Alcohol Insoluble.	Cinnamene.	Resin Esters.	Resin Acids.	Cinnamic Acid.		Acid No.	Sapon. No.	Ester No.
									Free.	Total.			
1.	5.18	...	39.30	24.24	8.22	5.41	...	54.5	145.0	90.5
2.	2.16	...	25.89	1.00	53.35	1.87	...	80.5	133.0	52.5
3.	4.88	...	31.75	14.87	15.83	3.60	...	...	...	...
4.	20.35	1.66	7.01	...	34.03	12.32	12.01	7.21	...	52.6	145.4	92.8
5.	7.12	...	39.19	21.27	3.01	5.19	...	...	...	...
6.	0.28	3.68	3.68	54.90	18.79	2.63	7.69	...	...	166.2	106.7
7.	3.24	3.25	51.39	9.42	13.22	8.14	...	60.9	153.8	92.9
8.	27.64	1.48	7.98	7.98	35.12	2.58	22.30	3.73	...	42.2	148.9	106.7
9.	23.49	4.48	5.17	5.02	37.34	9.75	16.74	5.57	...	50.3	115.7	65.4
10.	99.3	127.3	28.3
11.	54.76	...	3.19	100.4	135.4	35.0
12.	55.10	...	...	91.2	134.8	43.6
"Sweet gum"	22.37	0.32	5.24(a)	6.64(a)	22.86	34.76	2.11	12.65	28.02	68.7	131.6	62.9

(a) These insolubles were taken on different portions of the sample. The difference is due to the varying proportion of mechanical impurities and the alcohol insoluble on the same portion would show a smaller percentage than the ether insoluble.

at the present price which ranges from \$5.00 to \$10.00 per pound with practically no offerings. Under normal conditions liquid storax will average about \$0.20 per lb., but even then it is the worst adulterated material ever examined in our laboratory, being adulterated with Burgundy pitch, colophony, castor oil and extracted storax. At \$0.20 per pound American storax cannot compete, unless some cheap method of production can be worked out; the Forest Service is now busy on this problem. It is believed, however, that this material can be obtained for \$0.50 to \$1.00 per pound and that after a market is found the supply may warrant a material reduction.

CONCLUSION.

It would seem that "sweet gum" may be used in the place of liquid storax with good results; that it carries more cinnamic acid than commercial storax; that the odor and fixative properties of "sweet gum" are superior to the commercial variety of storax imported into the United States; that the southern portion of the United States should furnish all the storax required; that the old hardened balsam may be used in the manufacture of chewing gum.

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QUARTERLY REVIEW ON THE ADVANCES IN PHARMACY.

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USE OF SACCHARINE IN FRANCE.—At a recent meeting of the Therapeutic Society a discussion on the use of saccharine brought forth some interesting conclusions. The consensus of opinion was that in the present state of the sugar supply the employment of a mixture of one part of saccharine to one thousand parts of glucose should be allowed as a substitute for sugar. But its use in any other form such as in chocolates, jam, and other dietetic articles should be absolutely prohibited. It was also decided that its use in any product destined for infants, invalids and convalescents should also be absolutely forbidden. It was also deemed of great importance to rigorously insist that the presence of saccharine should

always be indicated whenever it is employed (*J. Pharm. Chem.*, 1917, 16, 61, through *The Pharm. Jour. and Pharmacist*, Sept. 1, 1917).

METHYL-RED AS AN INDICATOR.—Chemically this substance is known as *p*-dimethyl-aminoazobenzene-*o*-carboxylic acid, and is generally used in 0.2 per cent. solutions. It is much more delicate as an indicator than methyl-orange and for this reason is much more desirable to use when titrating with centinormal acid. When carbonates are present, heat is necessary, the carbon dioxide liberated behaving like an acid. It has been found that for determining the alkalinity of industrial waters there is no better indicator. Experience has also shown that it can be used very successfully in the estimation of oxalic and picric acids, and for alkali borates and cyanides. The change from red (acid) to yellow (alkaline) and the reverse being quite sharp (*Arch. Pharm.*, 1917, 255, 113-119, through *The Pharm. Jour. and Pharmacist*, Sept. 1, 1917).

JAPANESE ARTIFICIAL INDIGO.—According to a news item appearing in one of the recent pharmaceutical publications, a new process for the production of artificial indigo has been discovered in Japan. Before the war Japan, like many other countries, depended on Germany for this most important commodity, but this makes it probable that she will in the future be able to produce all that she needs. The discoverer is Dr. Kariya, at one time Professor in the Medical College of the Imperial University.

In this connection it may not be amiss to remark that considerable work is being done to improve the indigo plant with the purpose of increasing the yield. It is said that the methods of manufacture of indigo from the plant could be much improved upon.

A NEW REAGENT FOR ATROPINE, HYOSCYAMINE, AND SCOPOLAMINE.—A trace of either one of these drugs warmed on a watch-glass with a drop of a solution of two grams of *p*-dimethylamido benzaldehyde in six grams of sulphuric acid and 0.4 gram of water gives an intense red coloration which soon passes to a violet color. Cocaine, novatropine, and tropacocaine give no reaction at all. Other alkaloids give colors but not the same as the atropine group (*Ztschr. Anal. Chem.*, through *Schweiz. Apoth. Zeitung*, Feb. 15, 1917, through *The Pharm. Journ. and Pharmacist*, Aug. 25, 1917).

MEDICINAL PLANT CULTIVATION IN GOTHLAND.—It is said that this island is ideally situated and that the climate is comparatively

mild and dry. Among the plants cultivated were the following most important ones, drugs that at the present time are very scarce and upon which medicine largely depends for results in the treatment of disease: *Althea officinalis*, *Atropa Belladonna*, *Datura Stramonium*, *Digitalis purpurea*, *Hyoscyamus niger*, *Papaver somniferum*, and *Valeriana officinalis*. Five hundred poppy capsules yielded nine grams of dried latex which contained 4.6 per cent. of morphine. Valerian root was readily grown and in sufficient quantity to be profitable. In the cultivation of this plant it was found that if the flowering stems are removed the root system becomes strongly developed. A number of other plants were also cultivated experimentally and show promise of adding to or increasing the drug supply of the world (Lybing in *Svensk. Farm. Tidskrift*, through *Schweiz. Apotheker Zeitung*, 1917, p. 119).

A SIMPLE AND RAPID METHOD FOR DESTROYING ORGANIC MATTER IN THE DETECTION OF ARSENIC.—The method outlined is recommended as preferable to those usually followed for the destruction of organic matter in examinations for minute traces of arsenic. The organic matter is heated to a temperature of 300° C. until it is charred; it is then mixed in a mortar with 2 or 3 per cent. of its weight of pure calcium oxide; water is then added to slake the lime. The mixture is then transferred to a flat porcelain dish and heated at a dull redness until the ash is white or grayish. It requires no special attention: all the organic matter will be burnt off in an hour or two. When cool the ash is then mixed with water acidified with sulphuric acid, boiled, filtered, evaporated till fumes appear, then diluted with 8 to 10 volumes of water and introduced directly into the Marsh's apparatus (*Comptes rend.*, 1917, 165, 11, through *The Pharm. Jour. and Pharmacist*, Aug. 25).

IDENTIFICATION OF EMODIN-CONTAINING DRUGS.—The importance of some reliable method of identifying emodin-containing drugs cannot be overestimated. Nothing is more baffling to either the chemist or pharmacist than to be called upon to identify pharmaceutical preparations of these sort of drugs. For this reason this paper is peculiarly valuable.

Of liquid preparations, 10 mils are evaporated to a pilular consistence, made acid with either HCL or H₂SO₄, and the residue extracted several times with ether. Solid material is powdered, acidified, and extracted with ether. The addition of ammonia or

dilute alkali causes the formation of a red color in the water layer if emodin or other anthraquinone compounds are present. The color developed by phenolphthalein disappears in the course of an hour or so in the presence of a five or ten per cent. potassium or sodium hydroxid solution, while that of anthraquinone compound is permanent.

Aloes can be identified by the fluorescence occasioned by the addition of saturated aqueous solution of sodium borate, and this no matter what combination of emodin-containing drugs may be present. Rhubarb occasions a deep rose color with sodium borate, and cascara a brown, senna sometimes gives a light brown, but generally no color is produced. Rhubarb can be distinguished by obtaining a positive reaction with both bleaching powder (red) and iron sulphate (blue) solutions; so far as is at present known no other substances will give both reactions. As mentioned above cascara is distinguished by the brown color imparted to the water solution by sodium borate, provided the two tests for rhubarb are negative. It is likewise possible to identify cascara in any combination of emodin-containing drugs if rhubarb is absent. Senna is the hardest to detect but is distinguished by its failure to respond to any except the Borntrager reaction. This reaction is the phenolphthalein test mentioned above. Experience shows that it is sometimes difficult to get senna to respond even to this test, and this may be due to the fact that glucosides of the anthraquinone compounds are present in larger amounts than the compounds themselves. It has been found that senna cannot be distinguished in combination with any of the drugs. The fluorescence sometimes brought forth by cascara solution need not be confounded with aloes, as that brought forth by cascara has a brown color. An aqueous solution of the following chemicals on ether extractions of these emodin-containing drugs brought color reactions as follows:

Ammonium Thiocyanate—

Senna: Yellow to brownish color in water layer.

Rhubarb: Yellowish color in water layer.

Cascara: Brownish to rose-red in water layer.

Aloes: Red in ether and brown in water layer.

Ammonium Molybdate—

Aloes and Cascara: No color change.

Rhubarb: Mahogany brown in water layer.

Senna: Very light brown to yellowish in water layer.

Uranium Acetate—

Aloes, Cascara, and Senna: No color change.

Rhubarb: Reddish mahogany color in water layer.

Ammonium sulphate, persulphate, and oxalate bring forth no color changes (*J. Ind. and Eng. Chem.*, 1917, 9, 518-521, through *The Analyst*, vol. 47, p. 277, W. S. Hubbard).

HYDRASTIS CANADENSIS.—It is reported that this exceedingly valuable drug plant is now being successfully grown in Austria. Careful examination shows that the yield is of very much better quality than was expected, and that the drug is the equal or even the superior of the American-grown plant; this statement is justified because of its greater alkaloidal content, which after all is the only fair criterion (*Pharm. Zeitung*, vol. 62, 104, through *The Pharm. Jour. and Pharmacist*, July 21, 1917, p. 29).

AMERICAN SYNTHETICS.—The Council on Pharmacy and Chemistry, assisted by such support as the American Medical Association chemical laboratory can give, announces that it will undertake the task of making a study of the quality of American-made synthetics. Important unofficial synthetic drugs submitted by their manufacturers will be examined and later, when these drugs are placed on the market, the Council will make purchases and report on their purity. The Council is also willing to examine specimens of American-made drugs when submitted by dealers, provided the origin of these specimens is made known. Such control of synthetic drugs now made in this country because of war conditions will not only safeguard the public, but will in reality be of great service to those engaged in this industry, an industry necessarily as yet in the experimental stage (*Jour. A. M. A.*, Sept. 22, 1917, p. 1018).

HALAZONE.—Chemically this substance is parasulphonedichloramidobenzoic acid. It is said to be powerfully germicidal and is mainly recommended as a safe and ready means of sterilizing water. It is said to act like chlorine but to have the advantage of being stable in solid form. Dakin and Dunham report that in the presence of alkali carbonate, borate and phosphate, this chemical in the proportions of 1:200,000 to 1:500,000, and in from thirty to sixty minutes' time, sterilized polluted water contaminated with the following microorganisms: *Bacillus coli*, *Bacillus typhosus*, *Bacillus paratyphosus A* and *B*, *Cholera vibrio* and *Bacillus dysenteriae*.

Dosage: This chemical is commercially available in the form of tablets combined with sodium carbonate (or sodium borate) and sodium chloride; one of these tablets containing from 0.004 to 0.008 Gm. of the active chemical is added to a liter of water.

It is a white powder having a strong odor of chlorine. It is slightly soluble in water and chloroform; insoluble in petroleum ether; soluble in glacial acetic acid, benzene, and with the formation of the salt in alkali hydroxide solutions. Crystallizes in stout prisms from glacial acetic acid. When pure the melting point is 213° C. Parasulphonedichloramidobenzoic acid was first made by Dakin and Dunham (*British Medical Journal*, May 20, 1917, p. 682) under the name "Halazone." It is prepared by oxidizing paratoluenesulphoneamid to parasulphoneamidobenzoic acid and chlorinating the latter. It liberates iodine from neutral solution of sodium iodide and bromine from a neutral solution of sodium bromide. The available chlorine content is 26.2 per cent. and should not be lower than 24 per cent. (*Jour. Amer. Med. Assoc.*, Oct. 6, 1917, p. 1166).

AMBRINE.—This much advertised French preparation which has been recommended so highly for burns consists principally of hard paraffine, to which its efficacy is entirely due. Like many proprietary preparations of a secret nature its composition is not always constant. It consists essentially of a hard paraffine combined with a small quantity of an asphalt-like body and to which combination a fatty oil has been incorporated. Undoubtedly a number of commercial paraffines on the market, even without admixture of other substances will be found to answer just as well, in fact some observers have found them decidedly superior to ambrine. There is no reason why a simple paraffine wax, with a melting-point of between 44° and 48° C., should not answer every requirement for making these paraffine films (*Jour. Amer. Med. Assoc.*, vol. 68, p. 1497).

SPARTEINE MORE SOLUBLE IN COLD THAN IN HOT WATER.—It has been noticed that sparteine becomes less soluble in water as the temperature rises. The least elevation of temperature in a solution saturated in the cold causes a turbidity which rapidly disappears on cooling. It has also been noticed that the presence of sodium carbonate adds to the sensitiveness of the phenomenon to such a degree as to afford a delicate test for the identification of the base. To identify sparteine sulphate the test which follows is suggested: A

ten per cent. solution of this salt in water is made at ordinary temperature, it is then mixed with an equal volume of a ten per cent. solution of sodium carbonate. The tube containing this mixture is then rapidly immersed in a water-bath which has been heated to 40° C., the solution becoming at once milky. On immersing the tube in cold water the solution again becomes clear (*J. Pharm. Chim.*, 1917, 15, 359, through *The Pharm. Jour. and Pharmacist*, Sept. 8, 1917).

QUICKSILVER.—According to a recent news report the output of quicksilver in this country for the last year shows a considerable increase. The increase of last year over the previous one is over three times. In 1915 the output was 8,899 bottles of 75 pounds each and the succeeding year 29,932 bottles. There seems to be a resumption of activity in many of the old established mines, and experiments are being made with a view of recovering metal that was formerly lost. Experiments are also being made to increase the yield from low-grade ores and dumps. Of this total output Texas contributed 6,306 bottles, all from shaft-furnaces, while most of the old mines were reopened, some under new management, to take advantage of the higher prices. The output from Nevada was 2,198 bottles, and in Arizona, Oregon, and Washington only 383 bottles were obtained. In 1916 this country exported 8,880 bottles, the greater part of which went to England and Japan, in equal quantities. Only 5,659 bottles were imported, the most of which came from Spain and Italy, chiefly through the port of New York. The average monthly price rose to as high as \$295 per bottle in February, in which month as much as \$400 per bottle was obtained for small lots. In June the price took a violent tumble, it reaching the low price of \$74.50. In the last half of the year the average price (that is to say monthly price) varied between \$81.20 and \$74.50 per bottle. At the present time the price is in the neighborhood of \$105 per bottle.

ESTIMATION OF ANTIPYRINE.—The procedure described below for the iodometric estimation of antipyrine is said to give satisfactory results. The methods are both volumetric and gravimetric. With the volumetric method 99.6 per cent. of the antipyrine present is accounted for: 10 mls of an aqueous one per cent. solution of antipyrine are treated with 1 gram of potassium bicarbonate and an excess of $\frac{N}{10}$ iodine solution; after one hour the mixture is acidified

with one mil of acetic acid, 10 mls of chloroform are added, and the excess of iodine is titrated with thiosulphate solution. Two atoms of iodine combine with one molecule of antipyrine. The gravimetric method is as follows: A half gram of antipyrine is dissolved in 50 mls of distilled water, two grams of potassium bicarbonate are added and concentrated iodine solution is added drop by drop; the brown turbidity which is produced by the addition of each drop should disappear before the next drop is added. The addition of the iodine requires about thirty minutes. Colorless crystals of iodoantipyrine begin to form in about ten minutes, and are colored black as soon as an excess of iodine has been introduced. At the end of an hour the mixture is decolorized by the addition of sodium thiosulphate; the resulting precipitate is collected on a filter, washed with a small quantity of distilled water, dried, and weighed. A quantity of iodoantipyrine remains in solution and this is extracted with chloroform. It is asserted that 99 per cent. of the antipyrine actually present is found by this method (*J. Pharm. Chim.*, 1917, 15, J. Bougault, through *The Analyst*, vol. 47, 276).

PHENOLPHTHALEIN REAGENT FOR THE DETECTION OF BLOOD IN URINE.—A modification of Meyer's reagent, sodium hydrosulphite being substituted for the zinc dust, is recommended as a reliable test for the recognition of blood in urine. Two grams of phenolphthalein and twenty grams of potassium hydroxid are dissolved in 130 mls of water and the solution is boiled with the addition of 3 grams of sodium hydrosulphite until colorless. To detect blood in urine, 10 mls of the urine are mixed with 10 mls of alcohol containing 2 per cent. of acetic acid, and 4 mls of the reagent, to this mixture a few drops of hydrogen peroxide are added; the presence of blood brings forth a more or less intense red color on the addition of the hydrogen peroxide (*J. Pharm. Chim.*, 1917, 16, E. Justin Mueller, through *The Analyst*, vol. 47, 280).

THE DECOMPOSITION OF QUININE BISULPHATE.¹

BY BERNARD F. HOWARD, F.I.C., AND OLIVER CHICK.

The tendency to utilize the more soluble salts of quinine in the place of the sulphate, both for administration and also for hypodermic injection, was becoming very marked before the war. Since 1914, however, the increase in the use of the bisulphate, hydrochloride, and bihydrochloride has been phenomenal, and the time is obviously not very far distant when "quinine" will cease to be a synonym in pharmacy for the sulphate, and this will gradually fade into obscurity as one of the less useful salts. The authors of the present note wish to point out a certain property, noticeable in the bisulphate, but not in the sulphate, hydrochloride, or bihydrochloride which, owing to the increase in the popularity of the former, is of considerable interest to pharmacists and medical practitioners at the present time, namely the ease with which quinine as bisulphate is converted into quinicine, an alkaloid possessing a therapeutic value undoubtedly differing from that of quinine, and according to several authorities, actually harmful, the name quinotoxin having been used as a synonym for quinicine. This property of quinine bisulphate is no new phenomenon. Pasteur, in 1853 (*P.J.*, p. 373, and *Compt. Rend.*, XXXVII, p. 162), described the preparation of quinicine by heating quinine sulphate with water and a little sulphuric acid to 120—130° C., when the conversion of the quinine into quinicine was complete. David Howard (*P.J.*, 1872, p. 765) proved that the quinicine obtained by Pasteur was identical with the alkaloid that can be isolated from amorphous quinoidine. Hesse (*Annalen der Pharm.* 1875, vol. 178, p. 244) by heating quinine bisulphate alone to 135° C. completely converted it into quinicine. Turning to the Pharmacopœias, we find either a complete silence or a considerable divergence of opinion as to the "dangerous temperature" for the salt. "Codex Francais, 1908," mentions that it melts at 80° C. in its water of crystallization, and that if exsiccated it melts at 135°, being converted into quinicine. "U. S. Pharm. IX," 1 (and the "Pharm. Ned.") gives no melting point, and no mention of decomposition. "Pharm. Jap. III" gives melting point

¹ Paper accepted by the British Pharmaceutical Conference for publication in the Year-Book 1917, and reprinted from the *Pharmaceutical Journal and Pharmacist*.

of 80° C., but no mention of decomposition. "Brit. Pharm. Codex. 1907" states that the salt softens at 60° C., is semi-fluid at 70° C., melts at about 160° C., with decomposition, being converted into acid quinicine sulphate. It is curious to observe that the P.B. is one of very few official Pharmacopœias which fail to include this highly important salt. It should also be noted that in all the authorities above quoted the lowest temperature mentioned at which decomposition occurs is 120° C. The present authors consider that the uncertainty with regard to the actual temperature of decomposition is highly unsatisfactory and actually misleading, as it might be presumed that no decomposition would take place at any temperature *below* those limits mentioned in the authorities stated above. This, however, is not the case, and it has been found that decomposition will occur at very moderate temperatures, and under conditions which might be used (unless warning was given) in the preparation of a solution of the bisulphate for hypodermic injection. The "U. S. P. IX," p. 616, in describing "sterilization," recommends the heating of the solution to 115—120° C. The sterilization of a 10 per cent. solution of the salt at this temperature for thirty minutes actually caused 5 per cent. of the alkaloid to be decomposed into quinicine. A large number of experiments have been carried out with the salt to ascertain the dangerous temperature at which decomposition would occur. In each case the amount of decomposition was ascertained by separating the unchanged quinine from the quinicine in the following manner:

The mass, after being submitted to a constant heat for twenty-four hours, was dissolved, the boiling solution neutralized with ammonia, and the unchanged quinine sulphate crystallized out on cooling. This was filtered, dried and weighed. The quinine remaining in the mother liquor was obtained as tartrate by the addition of sodium potassium tartrate to the filtrate. The small amount of tartrate so obtained was weighed; the weight added to the quinine sulphate, giving the total quinine sulphate remaining unchanged. This value was converted into bisulphate by the factor 1.244, and, by deduction from the original weight of bisulphate, the percentage loss due to conversion into quinicine obtained. The quinicine was removed from the tartrate mother liquor by precipitation into ether, and identified by the melting point (60° C.), the specific rotation in chloroform (+44°), and the formation of insoluble thiocyanates and hypochlorites. The following conclusions have

been arrived at: (1) The exsiccation of quinine bisulphate at a safe temperature (*e. g.*, 35°–40° C.), before submitting to higher temperatures, *raises* the limit of temperature at which decomposition is first noticed. Whereas quinine bisulphate $C_{20}H_{24}N_2O_2$, H_2SO_4 , $7H_2O$ decomposed to the extent of 0.25 per cent. at 60° C., the exsiccated salt showed no decomposition at this temperature. (2) The addition of a *small* quantity of water (*e. g.*, half its own weight) at any dangerous temperature *increases* the amount of decomposition, whilst a *larger* quantity of water under similar conditions *retards* decomposition. The period of heating was twenty-four hours in all cases.

TABLE A AT 60° C.

Weight of bisulphate.	Weight of Water.	Per cent. of quinine converted into quinicine. Per cent.
10 grams	nil	0.25
10 "	5 grams.	4
10 "	10 "	0.1
10 "	20 "	nil

TABLE B AT 90° C.

10 grams	nil	50
10 "	5 grams.	35
10 "	10 "	19½
10 "	20 "	18½
10 "	30 "	15½
10 "	40 "	13
10 "	50 "	10½
10 "	100 "	5

(3) The dangerous limit of temperature at which quinine bisulphate heated alone, or in very strong solution for twenty-four hours, first shows decomposition was found to be 60° C. Above this point decomposition increased, and at 90° C. it amounted to 50 per cent. in twenty-four hours and 75 per cent. in forty-eight hours. If the water of crystallization is allowed to escape (*i. e.*, if the treatment is not carried out in a closed vessel), the amount of decomposition was reduced to 17 per cent. in twenty-four hours, owing to the exsiccation of the salt and consequent raising of the dangerous limit of temperature. (4) It is very doubtful if melting of the hydrated salt can ever occur without decomposition. (5) In all cases where decomposition occurred, a bright yellow coloration of the "melt," giving a highly colored, very refractory solution was noticed, and this may be considered a certain indication of decomposition.

We think that we have shown clearly that a danger exists in heating strong solutions of quinine bisulphate for any medicinal or pharmaceutical purpose, such as is directed for the preparation of solutions for hypodermic injection. As this danger does not exist in the case of the much more soluble bihydrochloride, or bihydrobromide, or the somewhat less soluble hydrochloride, we would suggest that it would be a wise step if one of these salts were invariably used where it may be necessary to heat the quinine salt for any such purpose before administration.

THE TRIPLE ALLIANCE IN MILITARY MEDICINE.¹

BY J. MADISON TAYLOR, M.D., PHILADELPHIA, PA.

The domain of military medicine is a blend of three major components or subjects: medicine, dentistry and pharmacy, with sanitation and hygiene essential factors of each; veterinary surgery is a branch. As to which one of these three departments of human welfare effort shall be esteemed paramount, there may be justifiable variants of opinion. There can be no question but each is on a practical par with the other in the objects they aim to achieve.

The first line of defense is the medical corps, for the reason, they it is who pick the fighting men as no others can. Without this critical selection there would come together a mere herd of dubious candidates—most expensive to the government by reason of potential defectives and dependents. The second line of defense we may safely claim is also the military surgeons, because theirs is the responsibility of putting these men in conditions of highest efficiency, of keeping them there, of forefending them from all preventable decrepitudes, of repairing them when damaged and of restoring them to the trenches, of reducing to a minimum their dependence upon either the government pay rolls or the public charge. Can you beat that for a man's sized contract?

In the process of preventing the preventable depreciation of life and vigor and fighting power, the medical corps must qualify as

¹Read before a joint-meeting of the National Pharmaceutical Service Association and the Philadelphia Branch of the American Pharmaceutical Association, November 13, 1917, and offered for consentaneous publication in the *New York Medical Record* and in the *Journal of the American Pharmaceutical Association*, and *The American Journal of Pharmacy*.

ceaselessly vigilant, first-class experts in testing all suspicious objects, sources of lurking perils among which are drinking water, foods, soils, infective agencies, environments, climates, dwelling or sojourning sites, whether outdoors or indoors or in a ship. There is included demand for expertness in chemistry, in bacteriology, in all the departments of clinical laboratory proficiencies. The time and strength and multitudinous demands made on the surgeon, notably in time of active participation in war, bring him to the verge of overstrain and then he absolutely must have expert help because he cannot do it all and act as administrator beside.

Frankly the development of military medicine has long outgrown the archaic and wholly unsatisfactory methods and practices of even as late as 1898 and demands complete readjustment in certain particulars.

The one outstanding deficiency is in the domain of expert pharmacy. All demurrers, all hesitation to supply full quota of modern pharmacists, can be met by making clear what he is now uniformly trained to supply, viz., expert knowledge in physiologic and pathologic (medical) chemistry, proficiencies in laboratory tests of urine, feces, gastric contents, of blood Wassermann, Widal, etc., and transfusions of blood, intravenous treatments, surgical dressings and diverse allied subjects and facilities; also examination of drinking water, foods, soils, localities, drainage, details of sanitation, also in diverse clinical laboratory manipulations at least as to details of matters to which the surgeon may be wholly unable to do justice.

There is therefore fullest justification for a triple alliance between surgeons, dental surgeons and expert pharmacists; otherwise the practical efficiency of the fighting, the executive and the financial personnel, must indubitably and seriously suffer.

The status of pharmacy as a profession in this country lacks much of what it deserves largely through the neglect or apathy of the profession of medicine and one reason is the crass commercialism which still lingers in her territories. Now pharmacy is just as much a profession *per se* as any other high-class industry progressing on a plane of lofty ethics and strict scientific conditions.

Pharmacy is as full a correlate of medicine as is dentistry or veterinary surgery, and her proponents are qualified to enjoy full recognition of the military and other bureaus. And yet to-day the medical profession, or corps, in the military service, fails to give scientific pharmacy that just encouragement and support essential

not only for its best growth and development but also for acting as the cordial handmaid, contributing to the solidarity of medicine as a whole.

Not more so-called pharmacists are needed in the service but *real ones*, trained in the full scientific, as well as practical methods now demanded of students in the better schools of pharmacy. Indeed the use of drugs has notably diminished of late because of the increasing efficacy of preventive and reconstructive measures.

The number of drug stores, apothecary shops or pharmacies are rapidly becoming more numerous than needed, yet they are of much use and the proprietor must live, hence the temptation to deal in nostrums and blatantly overpraised objects correlated with remedies. The correction of abuses it would seem might be affected by a greater sympathy and mutual appreciation of the domain of each, especially when the pharmacist is called upon more to exercise his skill as chemist, analyst, laboratory clinician and in other ways to coöperate in the day's work of the physician. The scientific spirit among pharmacists is absorbing attention, devotion and increasing personal sacrifices with great speed and force.

My interests in therapeutics are in other measures than drugs, yet for years I have been impressed by the splendid research work that the American Pharmaceutical Association has been doing for our benefit, quietly, unobtrusively, honestly and practically unknown to the medical profession. This is set forth candidly in the annual report on the Progress of Pharmacy in its exceedingly able *Journal*: also the research work of the splendid *American Journal of Pharmacy* for nearly a century past; these publications embracing thousands of pages of scientific matter better known and appreciated in foreign countries, I believe, than it is in our own.

It seems to me that the time has come for full correlations in which the medical profession should do all in its power to get shoulder to shoulder with its sister professions. The first step could well be that advocated by the *Journal of the American Medical Association* when it urges the recognition of pharmacy as a profession by the medical department of the U. S. Army and Navy. Such a recognition would go a long, long way toward placing the practice of pharmacy in this country in a satisfactory position to the world and to demonstrate its effectiveness.

What stands in the way? Apparently the attitude of the surgeon-general of the Army who has expressed himself as opposed to

the recognition of professional pharmacy in the Army as being "unnecessary" and, second, that if recognized it might necessitate the manufacture of medicinal preparations by Army pharmacists, and this would "offend" the large manufacturing pharmacists of the country who furnish the medical supplies. The surgeon-general is a man of deep penetration; in this instance, however, he has not given the subject the attention it deserves. When he does he will be more liberal and appreciate the present status.

It is claimed little or no place exists in military medical practice for the use of drugs, that the vital issues are surgical and sanitarial, and that drugs "if" (or when) needed, can be met by the use of "ready to use" products, tablets and the like, conveniently handed out by physicians, or by privates with little or no special training.

The answer to this is, of course, that proper results in clinical work cannot be attained without proper and adequate tools. One might as well urge that the Army surgeon should use "First Aid Packets" *only* in the surgical handling of the wounded, as to say that the military surgeon should be supplied only tablets for the treatment of diseased conditions.

The men of the trenches, God bless them, are entitled to the best possible pharmaceutical skill as well as other skill when ill, fully equivalent to what is available in civil life. Less than this is rank injustice or worse.

In normal times the fighting man, it is true, requires little medical treatment, and, also, probably during the first year of a war, but when bodies of our boys are wrecked and being repaired surgically, however skillfully done, diseased conditions supervene. In a short time all army hospitals will be filled to overflowing, not only with surgical, but also with medical cases demanding highest medical skill to reclaim. Why then should not our men have the best pharmaceutical skill to make more effective medical skill?

So far as the second objection of the surgeon-general is concerned, Editor Mayo of the *American Druggist* is in the right when he says there is no foundation for the fear expressed of venality. The first-class manufacturing pharmacists of this country are as patriotic as any other group. The amount of government business they receive, in comparison with their general and regular business, is exceedingly small. It is more than probable that the government contracts afford them negligible profits. They might be glad for relief from the business. Their services and their products are offered not for revenue only, but from patriotism.

I need only mention here the enormous assistance that the pharmacists as now taught and trained could be to medical men not alone along pharmaceutical, chemical, toxicological, bacteriological, but in X-Ray and other lines. I have emphasized this in a paper published recently in the *New York Medical Journal*.

H. R. Bill 5531 introduced by Representative The Hon. Geo. W. Edmonds of Philadelphia in the House of Representatives on July 25, 1917, is an excellent and important one, and I believe that this bill covers the field comprehensively and creditably. Doubtless it may need amendment in technical military details to meet the needs of the Army and Navy.

I express the hope and believe that the "brief" filed with Surgeon-General Gorgas by the pharmacists on August 10, 1917, will receive sympathetic attention. This extraordinarily able official could perform no act of public service more to the benefit of the medical department and his credit than the recognition of skilled, highly trained professional pharmacists, by supporting H. R. 5531 as an administration measure. His predecessor, Surgeon-General Torney, had established the dental corps and the veterinary corps. It would be peculiarly fitting if Surgeon-General Gorgas could have established the pharmaceutical corps.

PROPOSED ORGANIZATION OF UNITS FOR PROMOTING THE BILL BEFORE CONGRESS, KNOWN AS THE EDMONDS BILL FOR SECURING AN ARMY PHARMACEUTICAL CORPS.¹

BY DR. F. E. STEWART, PHILADELPHIA.

You are already familiar with the Edmonds Bill now before Congress, having as its object the establishment of a pharmaceutical corps in the United States Army. You know that one of the objects in organizing such a corps is to lessen the strain imposed by the war upon the medical department—a strain that is bound to increase as the war goes on.

¹ Read before the joint meeting of the National Pharmaceutical Service Association and the Philadelphia Branch of the American Pharmaceutical Association, Nov. 13, 1917.

Although the medical profession is by far in the lead of all others in responding to the country's urgent need, over 16,000 being enrolled at the present time, the fact remains that this figure already represents a large proportion of those fully qualified by physical condition, age, etc., to become medical officers that are still available. If the great armies now in course of formation, and others in prospect materialize, a deficiency of trained surgeons cannot but become manifest.

How shall this great shortage in physicians for the United States Army be met? Shall it be met by conscription? If the physicians of the country be largely drafted into the Army, what will become of the civil population? Is it necessary to sacrifice the civil public to meet army requirements? We believe that much of the sacrifice is unnecessary. We believe that the Edmonds Bill is a partial solution of the problem. Numerous duties now performed by physicians in the Army could be just as efficiently carried out by trained pharmacists, and the establishment of a pharmaceutical corps in the United States Army would provide a body of men not only educated and trained in our schools and colleges of pharmacy as pharmacists, but in many instances trained as business men also, and therefore especially qualified to aid the medical department.

To establish a pharmaceutical corps in the Army requires Congressional action. But why wait for Congressional action? Why not at once organize local pharmaceutical corps units in connection with our pharmaceutical schools and colleges? I am officially instructed by the executive committee of the National Pharmaceutical Service Association to present this suggestion for discussion this evening in connection with Dr. J. Madison Taylor's excellent paper based on work already being carried out successfully by the three scientific schools, medical, dental, and pharmaceutical, of Temple University of Philadelphia. Briefly, this organization of students and instructors, under the command of Dr. C. E. de M. Sajous, a retired militia officer, aims to give medical and dental graduates a comprehensive military education, and provides its pharmaceutical students such practical knowledge as will enable them to assume many of the duties now imposed upon the surgeon, thus permitting the latter to devote all his time to sufferers. It is obvious that in such circumstances a smaller number of surgeons would be required. This Medical Reserve Cadet Corps as it is called, is conducted on rigid

military lines, and in accord with the regulations of the United States Army.

As you know, the law already provides for the organization of Home Defense Corps. The organization and practical working of units with the adequate preparation of pharmaceutical students might be of decided value in crystallizing ideas and suggestions, and the successful working of the plan would encourage Congress to act favorably if it is found impossible to receive favorable action by the next Congress.

The training required to fit physicians for the medical department of the Army includes a regular drill of the same kind required of every soldier, no matter to what corps he is assigned. In addition to this drill, there are lectures and practical instruction in taking care of the sick and wounded and preventing disease. A certain amount of instruction in preparing and dispensing medicine is required, but very little is necessary because pharmacy in the army is as yet "hand-me-down-canned pharmacy" and this it must not continue to be.

It is officially stated that in the United States Army "the dispensing of drugs or compounding of prescriptions is done by the non-commissioned officers of the medical department." Those of you who are acquainted with conditions in the Army realize that many of these could not qualify to practice pharmacy in civil life, and the only reason why they are able to meet the pharmaceutical requirements of the Army is because there is practically very little true pharmacy in the Army.

We believe that there should be a complete overturning and reform in the method of handling the drug supplies in the Army, and that the entire business should be placed under the charge of a competent pharmaceutical corps. The pharmaceutical service of the U. S. Army is decidedly inferior to that of Germany, France, Spain or Japan. The commander of the German army pharmaceutical corps is attached to the medical section of the Prussian ministry of war and his rank is equal to that of the general of a brigade. The commander of the pharmaceutical corps of the French army is known as the inspector and also ranks as brigadier-general. Not only are these pharmaceutical corps in the German and French armies charged with the duty of providing the medical and surgical supplies by purchase or manufacture, and with the care, distribution and dispensing thereof, but they likewise make the sanitary, clinical

and chemical examinations for the medical corps. In reality these pharmacists are the chemists of the military service, as well as of the sanitary service.

For further information on this subject I beg to refer you to a paper by Mr. George M. Beringer, entitled "Pharmaceutical Service in the French Army," published in the *American Journal of Pharmacy*, November, 1917, page 514.

As chairman of the Committee on War Defense of the Pennsylvania Pharmaceutical Association, I have had occasion to confer with prominent medical officers in the Army and Navy and find one of the objections raised against the establishment of a pharmaceutical corps is that it will give dignity to the nostrum business and also extend the evils of self-medication, much to the detriment of the public health. I do not believe this objection valid. On the contrary I think the establishment of a pharmaceutical corps with character and duties as described in the Edmonds Bill would have the very opposite effect.

It is also urged that the establishment of such a corps would disturb the relations now existing between the medical men in the service and the hospital corps. This relation is now very satisfactory to the medical men. I am informed that the hospital corps men act as physicians' assistants and cheerfully do more or less menial work, for which college graduates are unfitted because of their superior education and social standing. This objection is taken care of in the Edmonds Bill. It is not the intent of the bill to provide an easy road to learning or a short cut to commissions. Those who enter the corps must work their way up. The bill provides educational prerequisites for entering the corps, outlines the character of the services required, and insures a better class of men to perform such services.

In conclusion, therefore, I again present for discussion the suggestion in regard to organizing local pharmaceutical corps units for promoting the Edmonds Bill in the manner above described and on the lines already inaugurated in the scientific departments of Temple University.

MEETING OF THE NATIONAL PHARMACEUTICAL SERVICE ASSOCIATION.

Congressman George W. Edmonds delivered an interesting address at the regular meeting of the National Pharmaceutical Service Association, held at the Philadelphia College of Pharmacy on Tuesday evening, November 13th. He stated that his principal object in coming to the meeting was to hear the comments of pharmacists on the proposed Bill, and to secure information which would aid him in urging its passage by Congress, and that he was very glad to say a word of encouragement to those laboring for recognition of pharmacists in the government service. Mr. Edmonds referred to the days when he was a student at the Philadelphia College of Pharmacy, and said that one of the strongest arguments that could be put forth in favor of recognition of pharmacists in the Army was that they are compelled to spend almost as much time in properly fitting themselves for their profession as are physicians, dentists and veterinarians. In other words, they deserve recognition as much as do the members of their sister profession. Congressman Edmonds urged the members to see that Congress be made familiar with the existing situation and with the provisions of the Edmonds Bill. He also impressed on the meeting that a strong committee, composed of representatives of the various divisions of the drug trade, must be sent to Washington, when a hearing is given on the Edmonds Bill by the House and Senate Committees on Military Affairs.

Dr. J. Madison Taylor made a strong appeal for recognition of pharmacists in his address "The Triple Alliance in Military Medicine." He stated that the domain of military medicine is a blend of three major subjects, medicine, dentistry and pharmacy, with sanitation and hygiene as essential factors of each; veterinary surgery as the branch. There can be no question but that each is on a practical parallel with the other in the best they aim to achieve. He declared that it would be particularly fitting for Surgeon-General Gorgas to recommend the creation of a Pharmaceutical Corps, inasmuch as his distinguished predecessors had recommended the formation of a dental corps and a veterinary corps.

Dr. F. E. Stewart read a paper entitled "Proposed Organization of Units for Promoting a Bill before Congress known as the

Edmonds Bill, for Securing an Army Pharmaceutical Corps." In this paper, he emphasized the necessity for showing the government the value of a Pharmaceutical Corps, and he felt that the best way of doing this was to organize such corps at the different colleges and among associations of pharmacists throughout the United States, who could be trained to step in whenever the government needed them. This paper was first discussed by Dr. John R. Minehart, dean, department of pharmacy, Temple University, who spoke of the military drill which was in vogue at the university he represented. He urged that graduates, as well as students of pharmacy, be impressed with the necessity of taking extra courses in sanitary subjects, so as to be fitted as physicians' assistants, when the country calls them to service.

As a result of the foregoing discussions, the following resolution was unanimously passed: "*Resolved*, that it is the sense of the meeting that we favor the suggestion that additions be made to the courses of instruction in colleges of pharmacy when needed to meet the requirements of the Medical Service of the Army and Navy."

Dr. P. Samuel Stout, after discussing the value of the co-operation of the pharmacist in the success of the medical work of the Army, moved that physicians be asked to coöperate in the movement to secure commissions for pharmacists, and that representatives of the medical profession be appointed on the Committee which presents the cause of the pharmacist at the hearing of the Bill before the Committee on Military Affairs.

One of the interesting features of the program was the presence of five men in uniform; two of them were called upon to speak. Private F. E. Berridge, of the post hospital connected with the Medical Department of Fort Totten, related some of his experiences as a pharmacist in the Medical Department of the Army.

A very gratifying report as to new members was made by the Secretary, 109 having been added to the list during the month.

The Treasurer's report showed a balance of \$155.85, after all bills had been paid.

Application for membership should be sent to the Secretary, Robert P. Fischelis, 828 N. Fifth Street, Philadelphia, Pa. Pharmacists now in the service are also urged to send their names and addresses to the Secretary, so that if the Pharmaceutical Corps is organized, they may be referred to the proper authorities.

Amiral,

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

UNICORN ROOT OF INFERIOR QUALITY.—Samples of true unicorn root, *Aletris farinosa* L., obtainable in interstate trade, have been examined. As a result of this study it was found that excessive amounts of total ash and acid-insoluble ash (sand) were present. In a few instances the limit of 16 per cent. given in the new National Formulary was exceeded. The bureau is of the opinion that material properly collected would contain not more than 10 per cent. of total ash, and the amount of insoluble ash would be considerably below 5 per cent. Of special interest is the fact that one sample which contained about 3 per cent. of true unicorn root consisted otherwise entirely of false unicorn root, *Chamaelirium luteum*.

The department will regard as adulterated or misbranded under the Food and Drugs Act any unicorn root containing total ash in excess of 16 per cent. or which contains material other than true unicorn root, *Aletris farinosa*. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

VIBURNUM OPULUS SUBSTITUTE.—A recent survey of the *Virburnum* barks on the market showed that while all samples of black haw (*Virburnum prunifolium*, U. S. P.) examined proved to be genuine, in most instances the bark of mountain maple (*Acer spicatum* Lam.) has been substituted for true cramp bark (*Virburnum opulus*, N. F.). A similar survey of preparations of *Virburnum opulus* L. on the market, especially of fluid extracts, indicates that most of them also were prepared from *Acer* species, very probably from *Acer spicatum*.

The bark of *Acer spicatum* may be distinguished from that of *Virburnum opulus* by its fracture, which is fibrous, due to the presence of large and numerous groups of long bast fibers, while that of *Virburnum opulus* is short and weak, since it has no bast fibers, or the bast fibers, if present, are few and scattered. The barks may, furthermore, be distinguished by the color which develops when a drop of 1 per cent. or 0.1 per cent ferric chlorid solution is placed on the inner surface of the bark. After several minutes a blue color develops in the case of *Acer spicatum*, while in the case of

Viburnum opulus a green color develops, due in both instances to the tannins present in the barks. If woody tissue is present on the inner surface of the bark, it should be removed before making the test.

The bureau will consider as adulteration the substitution in whole or in part of any *Acer* species for *Viburnum opulus* in barks or their preparations.

The bureau also considers that the term "cramp bark" applies only to *Viburnum opulus*, now official in the National Formulary, and consequently should not be used for barks from other sources or their preparations. (*Service and Regulatory Announcements, U. S. Dept. of Agriculture.*)

DESULPHURING PETROLEUM.—In the course of an interesting paper on "Sulphur in Petroleum Oils," read recently before the Institute of Petroleum Technologists, London, Dr. F. Mollwo Perkin said that Messrs. Lucas, Palmer, and himself had devised a desulphurizing process which was as yet in its initial stages. It consisted in the treatment of the oil at high temperatures with gaseous ammonia. The oil may be either in the liquid or gaseous state. If the oil is liquid, the pressure must be kept sufficiently high to prevent the oil gasifying at the temperature to which it is subjected. On the other hand, the temperature should be sufficiently high to cause the ammonia to dissociate. When the oil is treated in the form of vapor, it is passed through a heating system together with the ammonia before being condensed. It has been found that sulphureted hydrogen is given off from oils containing sulphur when treated in this way.—(Through *Journal of Industrial and Engineering Chemistry.*)

GREASE RECOVERY FROM SEWAGE.—Gratifying results says *Chemical Trade Journal*, 60 (1917), 382, have attended the activities of the Corporation of Bradford, England, in the work of the recovery of grease from the city's sewage. Mr. F. Ogden Whiteley points out in his report that last year it was estimated to raise \$300,000 from grease but the receipts have actually amounted to \$400,000, and it is estimated that \$350,000 will be provided from this source in the coming year in addition to \$25,000 from the sale of manure made from the precipitated sludge after the grease has been extracted. A substantial saving has also been made as regards the chemicals used in the process of precipitation. In

normal times, sulfuric acid was used for this purpose but large supplies of this chemical are now required for the government and the Bradford Corporation have made large purchases of nitercake to take its place.—(Through *Journal of Industrial and Engineering Chemistry*.)

BARIUM AND STRONTIUM.—“Since the beginning of the war a barium chemical industry has been established in the United States to supply barium carbonate, nitrate, chloride, chlorate, hydrate, and binoxide, which were formerly imported from Germany. In 1915 this industry consumed 10 per cent. of the output of domestic barite, but the consumption in 1916 was apparently somewhat larger. The barium chemicals have a wide variety of applications, perhaps the most important of which are the use of barium binoxide in the preparation of hydrogen peroxide, that of barium chloride as a water softener, and that of various salts in the manufacture of optical glass.

“The production of 108,547 short tons in 1915 was over twice as large as that of 1914, and in 1916 the output was again doubled. The value of the 1916 output was over \$1,000,000—a figure never attained before.

“Strontium salts, chiefly the nitrate, are employed to make ‘red fire,’ which is of wide use at this time not only for signal lights on battle fronts but for railway signals to promote the safe handling of trains at night. It is estimated that prior to 1914 about 2,000 tons of strontium nitrate were used annually in the manufacture of such ‘flares’ or ‘Costen’ and ‘Bengal’ lights and fireworks. Since 1915 the demand has increased considerably.

“Before the war celestite (strontium sulphate) and strontianite (strontium carbonate) were imported from Germany, England and Sicily. During 1914 and 1915 English celestite was obtained by manufacturers, but late in 1915 the exportation of strontium ores was embargoed by England.

“Apparently United States manufacturers are now using domestic ores containing only 85 per cent. of strontium sulphate, though they prefer not to use materials of lower grade than 92 per cent.”—(James M. Hill, Bulletin 666-W, 3 pp. U. S. Geological Survey Bulletin. Through *Journal of Industrial and Engineering Chemistry*.)

NEW METHOD FOR DETERMINING ALDEHYDIC SUGARS.—The process described is iodometric and depends on the fact that aldehydic sugars are oxidized by excess of iodine in presence of sodium carbonate with formation of hydriodic acid and the corresponding monobasic acid thus: $RCHO + H_2O + I_2 = RCOOH + 2HI$. The reaction is not immediate: in practice about three times the theoretical amount of iodine should be used; with glucose, oxidation is complete in about thirty minutes. The excess of iodine is then titrated in the usual manner with thiosulphate solution. Simultaneously slight secondary oxidations occur. To correct for these an experiment may be run simultaneously with a specimen of pure sugar of the kind being determined to obtain the correcting factor. The results obtained by this method are very accurate. Ketonic and non-reducing sugars are not sensibly oxidized under these conditions: aldehydic sugars may therefore be determined by the method in their presence. In the case of non-reducing sugars, such as sucrose, however, the accuracy of the method is influenced by the proportion of these present. When they greatly preponderate over the aldehydic sugar the amount of secondary oxidation interferes with the result. Comparative results may however be obtained by checking against controls made simultaneously with the pure non-reducing sugar. Unfortunately the reaction mixture has affinities for other organic substances besides the aldehydic sugars; hence its practical application is limited. (J. Bougault, *Comptes rend.*, 1917, 164, 1,008.)

COLOR REACTIONS OF AMMONIACAL COCHINEAL AND OF CARMINE.—An aqueous solution of ammoniacal cochineal gives a violet color with ammonia, which is not much modified on adding a slight excess of hydrochloric acid. If this acid solution is shaken out with amyl alcohol, and the solvent is separated, and then shaken with a little aqueous solution of uranium acetate; on separating the watery layer shows a fine amethyst violet color. Under similar conditions, carmine affords an emerald green color. Sometimes, commercial ammoniacal cochineal is met with which still contains some carmine, due to the incomplete transformation of the latter into carminamide. In this case, the amyl alcohol extract is treated with an excess of powdered calcium carbonate. After a few hours' contact, the whole is thrown on a filter, when the liquid passes almost colorless. The precipitate is washed with a little alcohol, then treated with water.

The aqueous solution thus obtained will be bright red, leaving the powder on the filter grayish-violet. This red aqueous filtrate is acidified with hydrochloric acid shaken out with amyl alcohol and tested with uranium acetate, as above. It gives the characteristic violet reaction of ammoniacal cochineal. The above insoluble calcium lake left on the filter is then decomposed with hydrochloric acid; the orange acid solution thus obtained tested in the same way after again shaking out with amyl alcohol, gives the emerald green color of carmine. (C. F. Muttelet, *Annales des Falsifications*, 1917, 10,228, through *The Pharmaceutical Journal and Pharmacist*.)

PRODUCTION OF ANTIPNEUMOCOCCIC SERUM.—In the production of immune serum for therapeutic purposes Cole and Moore say that strict attention must be paid to the immunologic specificity of the bacteria used for immunization. At present the only serum of which the therapeutic value has been proved is that effective against Type I pneumococcus infection. This serum should have agglutinating power for Type I pneumococcus and should have the power of protecting mice against large amounts of virulent culture. Experiments have shown that for producing the primary immunity most rapidly several series of small doses of dead cultures should be given, the injections being made daily for six or seven days, followed by a week in which no injections are made. To produce the highest type of immunity, probably, living organisms are required. These should be given in moderate doses daily for three days, with an interval of a week between each series of injections. By following accurately the methods described, horses may be made to produce rapidly a high grade of specific serum. The observations so far made indicate the importance of employing small doses of culture frequently repeated in this form of immunization. (*Journal of the American Medical Association*.)

SODIUM PERCHLORATE AS A MICRO-REAGENT.—In 1913 it was shown that sodium perchlorate affords a characteristic micro-crystalline precipitate with cocaine. Subsequently, it was found that the well-known reaction between sodium perchlorate and potassium salts was applicable to the micro-detection of the latter alkali. If a drop of a 4 or 5 per cent. solution of any soluble salt of potassium is treated with a drop of a 1:20 aqueous solution of sodium perchlorate, and the mixture is examined under a low power, as soon

as diffusion is complete, very numerous characteristic bipyramidal crystals, frequently truncated, somewhat resembling the crystals of magnesium ammonio-phosphate found in urine, will appear in the field. Under like conditions, rubidium and cesium afford typical micro-crystalline precipitates. Lithium, ammonium, and thallium give no such reaction. Besides cocaine, the soluble salts of tropococaine, berberine, narceine, cotarnine, and papaverine all give distinctive crystals with sodium perchlorate. A concentration of 1:20, or even 1:10, may be necessary for their rapid formation. Sometimes, as with papaverine, the precipitate at first has an emulsion-like aspect; but on re-solution, by warming, followed by friction, a turbidity is obtained which speedily affords tufts of crystals. Morphine, in 1:100 solution, or stronger, at once forms spontaneous groups of long needles radiating from a common center. The perchlorates of its alkyl derivatives, and especially codeine, give perchlorates which are much more soluble. Brucine, and especially strychnine, give characteristic micro-crystalline perchlorates with great facility. A 1:100 solution of brucine salts, or the alkaloid in free acetic acid when treated with sodium perchlorate on a slide, gives crystals spontaneously; and when rubbed with a fine stirrer until turbidity appears, a characteristic micro-crystalline reaction may be easily obtained with a dilution of 1:200, and on rubbing with a 1:1000 solution. In this case the micro-crystals are long, prismatic needles, often in stellate or fasciculated groups. They may be obtained with a dilution of 1:500. These crystals belong to the rhombic system, and may be hexagonal, lozenge-shaped, or octahedra, with rhombic bases. Strychnine gives crystals spontaneously with a dilution of 1:200, and on rubbing with a 1:1000 solution. In this case the micro-crystals are long, prismatic needles, often in stellate or fasciculated groups. They may be obtained with a few thousandths of a milligramme of alkaloidal salt by the aid of friction. The reaction, therefore, becomes of great value in confirming the presence of these two alkaloids in toxicological work, as specially for the presence of strychnine. Narcotine and veratrine, in presence of acetic acid, give amorphous precipitates with the reagent. They have the aspect of an emulsion of spheroidal corpuscles. With veratrine, the granular formation is very distinct in a dilution of 1:200. Drawings are given of the typical micro-crystals of the perchlorates of strychnine and of brucine. (G.

Deniges, *Annales Chim. analyt.*, 1917, 22, 103, through *The Pharmaceutical Journal and Pharmacist.*)

MEDICAL, PHARMACEUTICAL AND DISPENSING NOTES.

THE KIND OF CALCIUM CARBONATE TO BE USED IN MEDICINE.—It is pointed out that great importance attaches to the physical condition of precipitated chalk used for medicine. When the precipitation is performed in the cold, at about 0° C., a light, hydrated carbonate having a density of 1.7 is obtained. This will show only a few crystalline grains under a high magnification. If precipitation is conducted at about 30° C., the product will consist of minute rhombohedra, and have a density of 2.7. If boiling solutions are employed, the precipitate will be formed of prismatic rhombohedra and have a density of 2.9. Since the denser form is easy to manipulate and wash, most of the precipitated calcium carbonate of commerce is of this variety. Although this may answer all official tests it is by no means suitable for medicinal use, since it is much less readily attacked by acids, and a considerable portion will pass through the intestines unacted on by the acid secretions. When calcium carbonate is prescribed the form precipitated in the cold should be specified. This form alone should receive official recognition in future pharmacopœias. (A. Berthelot, *J. Pharm. Chim.*, 1917, 16, 57, through *The Pharmaceutical Journal and Pharmacist.*)

PHYSIOLOGIC AND ANTISEPTIC ACTION OF FLAVINE.—Fleming found that flavine has a very destructive action on leukocytes, and if the action on leukocytes and bacteria be each tested for twenty-four hours its leukocidal action is far in excess of its bactericidal action. In serum under certain conditions staphylococci will grow in 1 in 32000 flavine, *B. coli* in 1 in 1000, and *B. proteus* in 1 in 2000. Flavine 1 in 8000 appears to aid growth of *B. proteus*. Flavine 1 in 500 is usually unable to sterilize in twenty-four hours an equal volume of pus from a wound. Flavine injected intravenously in large doses immediately disappears from the blood (which acquires no bactericidal power), and is taken up by the tissues, which become yellow but acquire no inhibitory power on the growth of bacteria. Flavine 1 in 100 injected into the pleural or peritoneal cavities loses its antiseptic power within twenty-four hours. If the antiseptic is allowed to act on staphylococci and leukocytes alike for

twenty-four hours and the ratio is taken of its toxicity to both of these, phenol has a coefficient ten times better than flavine when the antiseptic acts on the microbes in serum and 250 times better when the bactericidal action is estimated in pus. (From the *Lancet*, London, through the *Journal of the American Medical Association*.)

NO NEED TO FEAR BOTULISM IN PROPERLY PREPARED PRODUCTS.—According to the bacteriologists of the United States Department of Agriculture there is no danger that the type of food poisoning known as "botulism" will result from eating fruits or vegetables which have been canned by any of the methods recommended by the United States Department of Agriculture, provided such directions have been followed carefully.

In case of any doubt as to whether the contents of a particular can have spoiled, the safest plan is to throw it away, although all danger of botulism may be avoided by boiling the contents of the can for a few minutes, since the *Bacillus botulinus* and the toxin or poison which it produces are killed by such treatment, since the spores of *B. botulinus* are killed by heating for one hour at 175 degrees Fahrenheit. No canned food of any kind which shows any signs of spoilage should ever be eaten.

THE THERAPEUTIC VALUE OF CINNAMON.—Dr. W. B. Drummond (*British Medical Journal*, June 9) states that essence of cinnamon in twenty-five-drop doses is one of the most effective remedies for coryza. With reference to the claim made for cinnamon as a preventive of measles, Dr. Drummond reports that he gave as much powdered cinnamon as would lie on a six-pence night and morning to twenty children in a hospital ward who had been exposed to infection by a nurse having German measles, and that at the end of four weeks no second case of German measles had occurred. (*The Australasian Journal of Pharmacy*.)

THE PARAFFIN TREATMENT OF BURNS.—Surgeon-Colonel Hurd, in the *Lancet*, June 2, states that he has used a preparation made according to the following formula for nearly a year, with highly satisfactory results:

Resin	1 part.
Beeswax	1 part.
Paraffin	4 parts.

Melt in a dish set in boiling water for half an hour. Apply with a metal spray to form a thick layer on the affected surface. Next cover with a very thin layer of cotton, while the wax is still hot, and then with a camel's-hair brush paint on three or four layers of the wax. After it has hardened for ten minutes bandage.

FOR VERMIN IN THE TRENCHES.—A mixture of equal parts of oil of peppermint and oil of eucalyptus is stated to answer splendidly for lice. A little is smeared on the body with the fingers. (N. Aylmer Coates, *Prescriber*, June, 1917, 127, through *The Pharmaceutical Journal and Pharmacist*.)

MANGE, RINGWORM, AND LICE IN HORSES.—In an article describing the conditions under which horses may become affected with skin disease, a very full account of the methods of treatment for mange, ringworm, and lice is given. For mange it has been found that a mixture of sulphur, 4 oz.; oil of tar, 1 oz.; sperm oil, 1 quart, gives the best results. Before applying this a cleansing agent should be used, and for this purpose, paraffin emulsion is the best thing to use. When the washed surface is dry the sulphur mixture is applied with a brush, and well brushed in. The application is not disturbed for six days, when it should be removed by washing. For ringworm, tincture of iodine has been mostly used, and with good results. Two applications are usually sufficient. If the lesions are scattered and widespread, the oily dressing used for mange gives the best results, one application well applied generally being sufficient. For lice, after clipping, as in the other cases, the thorough application of liquor cresolis and water, 1 in 40, gives very good results. (The cresol preparation is not specified, but probably liq. cresolis saponatus would answer, or simply a solution of soft soap in an equal weight of cresol.) Paraffin emulsion also is excellent, and it thoroughly cleanses the skin at the same time. Stavesacre solutions are most satisfactory. (Capt. J. F. D. Tutt, A.V.C., *Vet. Rec.*, May 5, 1917, 461, through *The Pharmaceutical Journal and Pharmacist*.)

COMMERCIAL AND TRADE INTEREST.

SYNTHETIC RUBBER FROM CARBIDE.—The manufacture of acetone with a view to the production of synthetic rubber is of considerable importance in Germany at present. The importance of

this industry, says *Chemical Trade Journal*, 61 (1917), 26, is indicated by the fact that some of the largest firms in Germany, such as the Konsortium fur Elektrochemische Industrie of Nurnberg, the Elektrotech. Werke of Bitterfeld, the Farbenfab. of Bayer & Co., Griesheim, and others, have been occupied with this problem for some years. There are firms in Germany producing 10 to 50 tons of carbide per day in order to convert the acetylene into acetic acid and acetone, the latter being intended chiefly for the production of synthetic rubber.

This new industry should be of special interest to Switzerland, since the necessary carbide will in the future be available in large quantities in that country. After the war, the export of carbide will be considerably reduced and this product will, therefore, become much cheaper. On the other hand, the price of rubber will remain high for several years. (From *The Journal of Industrial and Engineering Chemistry*.)

POTASH AND OTHER CHEMICALS IN JAPAN'S TRADE.—Consul-General George H. Scidmore, Yokohama, reports that Japanese exports of potassium chlorate to American and other destinations are increasing at a remarkable rate. The *Japan Advertiser* states that this trade development is regarded as a sign of the country's industrial progress. The article was principally imported from Europe before the war, to meet the increasing demand from match manufacturers. When the war broke out and shipments from France stopped, Japan's total supply was only 500 barrels a month.

The production in this country now far exceeds consumption. A dealer in chemicals is quoted by the *Advertiser* as saying that the total shipments from Yokohama for the first six months of the year were valued at \$280,812, the principal destinations being China, British India, the Dutch East Indies, Russia, America, and Great Britain. (From *Commerce Reports*.)

JAPANESE PRODUCTION AND EXPORTS OF SULPHURIC ACID.—Since the beginning of the year the price of sulphuric acid in Japan has been steadily advancing, owing to increased exports to Russia and China, and also to the Allies for war purposes. As a result, some of the artificial-fertilizer companies have reduced the output of fertilizers and devoted their energies to the manufacture of sulphuric acid, while a number of companies have been established ex-

clusively for the manufacture of the chemical. Its output has accordingly increased in a large measure, and some anxiety is entertained with regard to overproduction after the war. According to latest investigations, the present total output in this country amounts to 582,500 tons a year, excluding the output of a few factories that is not made public. Of this quantity, 421,150 tons is consumed by the manufacturers themselves for the manufacture of sulphate of ammonia, hydrochloric acid, etc., leaving the remaining 161,150 tons available for general requirements. The domestic demands now amount to about 100,000 tons a year, so that the quantity for export is about 60,000 tons. It is estimated that the output of sulphuric acid, if turned out at the present rate, will be in excess of the demand by about 100,000 tons on the resumption of normal conditions after the war. (Through Canadian Department of Trade and Commerce, translated from *Japan Weekly Chronicle*.)

VEGETABLE-WAX INDUSTRY OF JAPAN.—An industry of Japan which has made remarkable progress in recent years is that concerned with the extraction of vegetable wax, which is coming into greater demand in foreign markets. The output has been gradually increasing, and now stands in the neighborhood of 1,700,000 yen, or about \$850,000 per year. The work of extraction is being organized on a larger scale.

The principal regions of production are in the Island of Kyushu, especially around the city of Fukuoka, which accounts for nearly half of the total output. The product is used abroad principally in the manufacture of polishes, pomade and soaps, and in dressing leather.

Most of this vegetable wax is derived from the fruit kernels of a tree peculiar to Japan, which begins to fruit at about 15 years, and sometimes bears heavily when it is over 100 years old. It reaches a height of 20 to 25 feet, and produces from 30 to 150 pounds of nuts annually. The best wax is made from nuts that have been kept over the winter, and, generally speaking, the quality of the product improves with the age of the nut. The wax is extracted by crushing and steaming the nuts, and then subjecting the mass to pressure. A second wax is secured by repressing.

The crude wax, which solidifies at 50 degrees, is cast into round moulds of a little more than a pound each. It is next refined, the process used being a traditional one and peculiar to Japan. It is

mixed with wood or charcoal, ash and water, thoroughly boiled, and dropped into cold water, so as to form what are called wax flowers. These are taken out and exposed to the sun for about 20 days, when the process of boiling, making the flowers, and sunning is repeated. The wax is then boiled a third time, and the best quality taken off the top while it is in a molten condition. Recently improved methods have begun to come into use, and the crude wax is treated with an alkaline solution. (From *Commerce Reports*.)

EXPORTS OF MINERAL OILS SHOW BIG INCREASE.—More mineral oils were exported from the United States during the fiscal year 1917 than ever before, the total amounting to 2,749,434 gallons valued at \$230,953,149, according to figures made public by the Bureau of Foreign and Domestic Commerce, of the Department of Commerce. This was an increase of approximately 300,000,000 gallons and \$65,000,000 over 1916 and about 470,000,000 gallons and \$79,000,000 over 1914, the last normal year before the war. Only a small percentage of the total exported was crude oil. (From the U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C.)

CODFISH AND OIL TRADE OF NORWAY.—The spring cod fishery of the Finmarken coast closed on June 23. The returns for the season are 17,056,550 kilos (calculated at 6,317,240 cod), as against 26,854,600 kilos (9,946,150 cod) in 1916, 43,279,200 kilos (16,020,330 cod) in 1915, 63,612,650 kilos (23,560,240 cod) in 1914, and 93,923,800 kilos (34,787,000 cod) in 1913. The very poor returns this year are caused chiefly by the uncertain conditions, great parts of the fishing districts lying inside of the German "danger zone."

As the fish ruled fat the quantity of oil was comparatively large. In Lofoten 100 liters of liver yielded an average of 51 liters of steamed medicinal oil, as against 49 liters last year. The fish also ruled somewhat larger than last year. (Canadian Department of Trade and Commerce, Ottawa, Sept. 24, through *Commerce Reports*.)

CINCHONA CULTIVATION.—The areas under cinchona in Bengal during the year 1916-17, according to the government report, have been increased to 2,405 acres, as against 2,295 acres in the previous

year; and attempts have been made to extend the plantations gradually. Systematic seed collection, based on analysis of parent trees, has been practised, as in previous years. Owing to the European war, the unit rate of bark has much increased, the average market unit rate for 1916-17 being 20-60 cents. Large numbers of cinchona trees at Munsong have arrived at maturity, but on account of the insufficiency of money it was found impossible to harvest a large quantity of dry bark for the factory, the Budget grant having been fixed to a limited amount for five years. (From *The Pharmaceutical Journal and Pharmacist*.)

WARNING AGAINST MEDICINE FRAUD.—“Imposters posing as federal employees are trying to sell rheumatism and other ‘cures’ which they represent to the gullible as being made by the United States Government,” is a warning issued by the Bureau of Chemistry, United States Department of Agriculture. Letters received from residents of Minnesota and South Dakota tell of such misrepresentations by agents of the “United States Medical Dispensary” or “Dr. Henry Post,” Washington, D. C. The packages and labels guaranteed for \$20 “cures” for various ailments but failed to give any address of those who are to refund. Federal inspectors have been unable to locate any such concern or doctor in Washington or elsewhere. (Office of Information, U. S. Dep’t of Agriculture.)

CORRESPONDENCE.

BALTIMORE, November 20, 1917.

EDITOR AMERICAN JOURNAL OF PHARMACY,
145 N. Tenth St.,
Philadelphia, Pa.

I am sending you herewith, copy of a letter which our committee, charged with the creation of a permanent memorial to the late Dr. Charles Caspari, Jr., is mailing to such of his former students, friends and admirers as they can reach. For the benefit of those we do not know of and who may wish to contribute to this memorial, we will appreciate such publicity as you will give this letter.

I am directed by the committee to express to you their appreciation for such assistance as you can give us in this connection.

Very truly yours,

E. F. KELLY.

THE CHARLES CASPARI, JR., MEMORIAL COMMITTEE.

BALTIMORE, MD., November 15, 1917.

At a meeting in memory of the late Prof. Charles Caspari, Jr., held at the University of Maryland on October 23, several suggestions were offered that some permanent memorial of his life be established. Following these suggestions, Dr. J. F. Hancock, chairman, asked the officers and those gentlemen who at the meeting represented the College of Pharmacy and the manufacturing, wholesale and retail pharmacists, to act as a committee to consider these suggestions and suggest some suitable plan of action. The committee on November 8 organized and elected Dr. J. F. Hancock chairman and E. F. Kelly secretary-treasurer. After careful consideration and general discussion of the matter, the committee has decided to ask contributions from former students, friends and admirers, to provide an oil portrait of Prof. Caspari, to be hung on the walls of the department of pharmacy, University of Maryland, and a scholarship, or scholarships, for senior students in the department of pharmacy, to be awarded annually by the faculty of pharmacy, and to be known as The Charles Caspari, Jr., Scholarship, or Scholarships.

The fund collected, after the cost of the portrait and necessary expenses are deducted, will be invested in stable, interest-bearing securities, preferably government bonds, and these will be trusted to the faculty of pharmacy of the University of Maryland, the interest only to be used in providing the scholarship, or scholarships, which are to cover the annual tuition fee only.

It is confidently believed by the committee that a memorial of such practical value would have most appealed to him whom we honor, and who gave his best efforts to the instruction of students. It is impossible to address personally all who may wish to take part in this memorial, but the committee will give the movement the widest publicity and hope that all who may desire to do so will consider themselves invited to contribute to the fund.

It is requested that all contributions be made payable to E. F.

Kelly, secretary-treasurer, and addressed to him at Lombard and Greene Streets, Baltimore, Maryland.

Respectfully,

JOHN F. HANCOCK, Chairman,
D. M. R. CULBRETH,
JOHN B. THOMAS,
A. R. L. DOHME,
JOHN C. MUTH,
E. F. KELLY,

Committee.

BOOK REVIEWS.

ELEMENTARY LESSONS IN LATIN, by Otto A. Wall, M.D., Ph.G., Professor of Materia Medica, Pharmacognosy and Botany in the St. Louis College of Pharmacy.

Professor Wall states in the preface of this volume that "the elementary principles of the Latin language contained in this little book are sufficient to enable the student to read the Latin edition of the German pharmacopœia, which is as much Latin as is necessary for the pharmaceutical or medical student." He might have added that it is far more than the average student of these professions ever acquires. The majority of pharmaceutical students and many medical students enter college with no training at all in Latin, and in the limited time which can be devoted to this subject in college a knowledge of only a small portion of the grammar can be gained, and the study of Latin is limited to those forms and principles which are absolutely essential to enable the student to understand Latin titles and prescriptions. Professor Wall's treatment of the subject is therefore much more complete than is found in the ordinary textbook on pharmaceutical Latin.

The book is divided into three parts; Part I includes eighty pages and is devoted entirely to the forms and principles of grammar. The verb forms, active and passive, are given in full although all tenses of the indicative and subjunctive except the present are placed in an appendix. Many of the irregular verbs are also given and the uses of moods and of the verbal noun and adjective forms are explained. The declension of nouns, pronouns, and adjectives and the rules for their use receive liberal treatment and enough syntax

is given to fully justify the author in his statement that a knowledge of these principles will enable the student to read the Latin edition of the German pharmacopœia.

Part II contains the vocabularies and reading exercises. These cover sixty pages. Professor Wall believes that by the separation of the grammar from the exercises and vocabularies the student can more clearly grasp the essentials of the language and escape the confusion of mind which results from having the grammar, vocabularies and exercises intermixed. Many teachers will not agree with him in his view, believing that forms and constructions are learned more rapidly by constant practice in their use in sentences. In fact the practice of interspersing grammar work among the reading exercise is almost invariably followed by authors of beginners' books in Latin.

Part III, consisting of eight pages, is devoted to a comparison of Latin words with their English derivatives and to a brief study of the formation of words, and is designed to assist the student in acquiring a Latin vocabulary.

No general vocabulary is given, but numerous short vocabularies totaling some nine hundred words are scattered through Part II. Even with these it is necessary for the student "to refer to a dictionary for the meaning of many of the words in the reading exercises." This arrangement of vocabularies does not seem as satisfactory as the method usually followed and the use of a separate lexicon certainly does not tend to a saving of time in the preparation of the lessons. In our opinion the book though containing some good features is hardly likely to displace the Latin textbooks already in use in colleges of pharmacy.

W. S. TRUESDELL.

THE PRESCRIPTION, by Otto A. Wall, Ph.G., M.D. Fourth and Revised Edition. C. V. Mosby Co., St. Louis, 1917.

So great is the wealth of material contained in this book of two hundred and seventy-three pages, that one finds it difficult to treat it adequately in the limited space of the customary review.

In the treatment of his subject the author has divided it into two grand divisions, one treating of permanent prescriptions and the other of extemporaneous prescriptions. The classification, permanent, is applied to such formulas as are contained in standard works, as the various pharmacopœias and formularies.

In the preliminary chapter, entitled "General Considerations," the various forms, in which remedies may be prescribed and dispensed, are given, together with the medicinal uses to which they are best suited and the Latin terms applied to each class. This information is presented in a very complete and interesting manner. Attention is, also, here given to the "Form of Formulas."

The chapter on "Weights and Measures" is a treatise, in itself, upon the subject. It contains tables of the various systems, and an account of the history of the origin of the various units.

The chapter devoted to the "Language" of the prescription gives extended treatment of the subject of prescription Latin. The various declensions and conjugations are clearly and concisely given, and a vocabulary of Latin words, phrases and abbreviations, covering twenty-three pages is included. By a study of this chapter, one having little or no knowledge of Latin might become proficient in the pharmaceutical and medical application of the language.

Under the head of "Extemporaneous Prescriptions" the various parts of the prescription, how it is built up, incompatibilities, the determination of dosage, and other related subjects are clearly and fully discussed. Much sound advice is given to the prescriber, from a study of which the physician as well as the pharmacist would profit.

The final portion of the work is given to the "History of the Prescription." In it is given an interesting account of the evolution of the prescription, its superscription and other signs used in prescribing.

The mechanical make-up of the book is excellent. The type and imprint being clear, clean and easily read.

The author has handled his subject, in general, in a logical, lucid and forceful manner. As a result of this, the work is not only a valuable book for the reference library of the pharmacist and the physician, but, also, an excellent one for hours of interesting and instructive reading.

G. M. BERINGER, JR.

EVERYMAN'S CHEMISTRY. THE CHEMIST'S POINT OF VIEW AND HIS RECENT WORK TOLD FOR THE LAYMAN, by Ellwood Hendrick. Harper's Modern Science Series, Harper & Bros., Publishers, New York and London. 346 pages, with an appendix and an index.

The need and desire for popular education in scientific subjects

seems to be growing rapidly. There have been published during the past ten years more books of a popular scientific type, such as the "Chemistry of Familiar Things," "Household Chemistry," "Chemistry in the Home," etc., than doubtless appeared during the preceding 100 years.

The book entitled "Everyman's Chemistry" is one of the foregoing type, yet essentially different. Its style is clever and appealing. Such chapter headings as "Chemical Miseries" and "The Red Headed Halogens" give the reader a sense of anticipatory enjoyment which is not denied him when the subject matter is reached. The first chapter is a convincing example of how to develop the reader's interest in a subject which he may have believed too difficult for him to understand. The final paragraph from this chapter is well worth quoting:

"Chemistry is not only the intelligence department of industry; it is everywhere and we cannot get away from it. Every kitchen is a laboratory, every baker is a chemical manufacturer and every butcher is a chemical warehouse man. Chemistry washes us, launders our clothes, bleaches and dyes them; it provides us with metals, with our morning paper and with books; it helps the farmer to grow our food; and when all is over, whether we be burned to ashes or buried in the ground, it is by chemical processes that our bodies go back again into the great order of things."

It is surprising how clearly and interestingly the author discusses such difficult technical subjects as the ionic theory and colloids. The description of the composition and properties of permutit is especially noteworthy, and the articles on iron and steel, glass, lime, mortar and cement, and indeed, many others in the inorganic portion of the book, are excellent.

The portion of the book devoted to organic compounds is a disappointment. There is much of interest and value, it is true, but why such important organic substances as argol, tartaric acid, citric acid, gelatin and baking powders, for instance, should not even be mentioned when considerable space is given to the structural formulas of a number of the coal tar intermediates, such as paranitraniline, amido-naphthol disulphonic acid; etc., is difficult to understand. Then, too, it is strange to spend so much time in discussing Van't Hoff and his studies in stereo-chemistry, without mentioning even a single word as regards the influence of Pasteur's work on the optical activity of the tartaric acids in this connection.

There are statements, too, in the latter portion of the book, which are misleading, such as this from page 289, under Candy: "The glucose is made from corn and the solution is treated with a mild acid to split off the simple sugar from the starch." Also this from page 303: "You can nitrify cellulose and make nitrocellulose an explosive compound known as guncotton. If you attempt to do this to starch it is apt to split right down to sugars. Mixed nitric and sulphuric acids dissolve cellulose to nitrocellulose."

The worst error in the entire book, however, consists in calling resins gums and referring to them as polymerized sugars and then citing rosin as a type. The word resin does not appear in this portion of the book at all.

There are two appendices, containing respectively a tabular synopsis of the elements and a bibliography of books along similar lines or which were consulted in preparing the book. There are a few typographical errors in the book and in the index, which indicate somewhat hasty preparation.

Taking it altogether, however, and making due allowance for the defects which have been mentioned, the book is one from which every reader, whether he be chemist or layman, should draw pleasure and profit.

C. H. LAW.

PERSONAL ITEMS.

DR. JOHN A. RODDY.—Shortly after the declaration of war with Germany, John A. Roddy, professor of bacteriology and hygiene in the Philadelphia College of Pharmacy and associate in hygiene and bacteriology at the Jefferson Medical College, was called into the Army Medical Service. He was commissioned as lieutenant and assigned to Fort Slocum, where he was actively engaged in the examination and treatment of the thousands of army recruits received at that station. Recently he was transferred to Camp Dix, N. J., and assigned to the 303 Engineers Regiment. His many friends will be pleased to learn that he was promoted and commissioned captain on September 29, 1917.

DAVID W. RAMSAUER, a graduate of the Philadelphia College of Pharmacy in 1902 and the winner of the Procter Prize that year, has been elected vice-president of the Grover-Stewart Drug Co., of

Jacksonville, Florida. Since leaving the college Mr. Ramsauer has had a brilliant career. He is now an ex-president of the Florida State Pharmaceutical Association, secretary of the State Pharmaceutical Examining Board. He has likewise been prominent in business circles and in civic matters in his home town of Palatka.

PROFESSOR AND MRS. JOHN URI LLOYD announce the wedding of their daughter, Dorothy Webster, to Mr. James Arthur Brett, Jr., on Monday, October 22. The professor's numerous pharmaceutical friends, including the readers of the *AMERICAN JOURNAL OF PHARMACY*, extend sincere congratulations.

CHARLES E. HAYWARD recently celebrated the twenty-fifth anniversary of his connection with the H. K. Mulford Co. He entered the employ of that firm as an assistant in the tablet department. By his application and thoroughness he won advancement and in 1909 was made general superintendent of their laboratories and in 1913 was elected a member of the board of directors. In celebration of his twenty-five years of service, the board of directors of the company presented him with a handsome gold watch suitably engraved.

CHARLES A. SMITH for more than twenty-five years associated with the Jacobs pharmacies in Atlanta, Ga., has severed his connection with that firm and has opened a new store in the new Arcade Building in the center of the business section of Atlanta. The new concern will be known as the Charles A. Smith Drug Company and doubtless will be one of the leading stores in that southern metropolis.

M. GUIMAND GEORGES, a member of the French Army Pharmaceutical Corps, has been honored for heroic service, the military medal and war cross having been conferred on him.

M. RICHARDOU, a pharmacist aide-major attached to the Territorial Army of France, was by a decree on July 27 last named a Chevalier of the Legion of Honor.

PROF. CHARLES E. VANDERKLEED, for many years associated as head chemist with Messrs. H. K. Mulford Co., has severed his connection with that firm. With ample capital and backing he has

organized the Markleed Co., who expect to engage in the manufacture of a number of important medicinal and technical chemicals.

OBITUARY NOTICES.

CHARLES HOLZHAUER.—It has again become our sad duty to record the decease of another leader of American pharmacy. Charles Holzhauer, President of the American Pharmaceutical Association, died suddenly at his home in Newark, N. J., on Monday afternoon, November 19, at the age of sixty-nine years. He was at home, playing with his grandchildren, whose company and play he greatly enjoyed, when the call of death came.

Charles Holzhauer was a self-made man in every sense that these words imply. He applied himself energetically in whatever he undertook; be it his personal business, Association work in pharmacy, work of the church, corporation or civic duty alike received his enthusiastic best efforts. Those who were associated with him in pharmaceutical circles knew of his generous, big-hearted philanthropy by his deeds and never by any statements of his own, for he was not wont to say much about his personal doings and disliked anything pertaining to show or notoriety.

In the New Jersey Pharmaceutical Association, he was the leader whose sound judgment and advice was sought in many trying situations. In the American Pharmaceutical Association, he was always faithful in attendance and noteworthy in service, and it is our most sincere regret that he was not spared to fulfil his ambition to carry into effect his plans as president for this year.

Mr. Edward A. Sayre, a personal friend and pharmaceutical associate of many years, will contribute to an early number of the AMERICAN JOURNAL OF PHARMACY an appropriate memoir of our deceased friend.

SIR EDWARD EVANS. On October 10, at Spital Old Hall, Bromborough, Cheshire, death claimed Sir Edward Evans, who long held a prominent position in the wholesale drug circles in England. He was the second son of Edward Evans and grandson of the founder of the wholesale drug business now carried on by Evans Sons, Leshner & Webb, Ltd., of London and Liverpool and with branches in Montreal and New York. At the time of his decease he was chairman of this corporation.

He had a varied experience in the importing and wholesale dealing in drug products and had a host of friends in the various drug organizations and pharmaceutical societies in which he was an active worker. He served a term as president of the Drug Club and was president of the British Pharmaceutical Conference 1911-1912.

He took an active part in political matters and his ability as an ardent worker as a local or district organizer in the Liberal Party was recognized by the leaders of that political party. He was knighted in 1906, and in 1910, in recognition of his record in political and social reform service, his Liverpool friends presented him with his portrait, the presentation address being made by the then Prime Minister, Mr. H. H. Asquith.

His decease in his seventy-second year terminated a successful business and social career marked by a high sense of integrity and honor.

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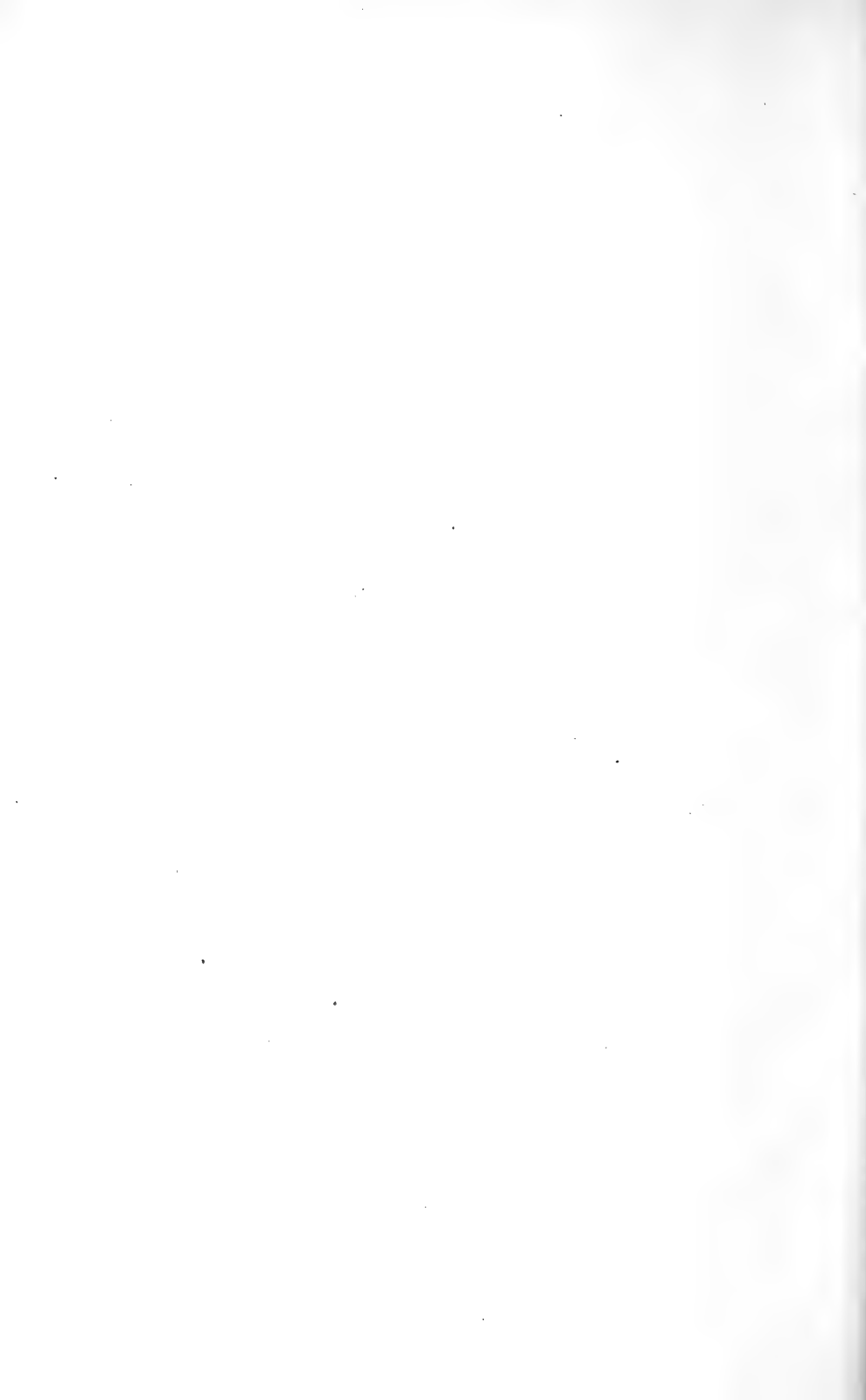
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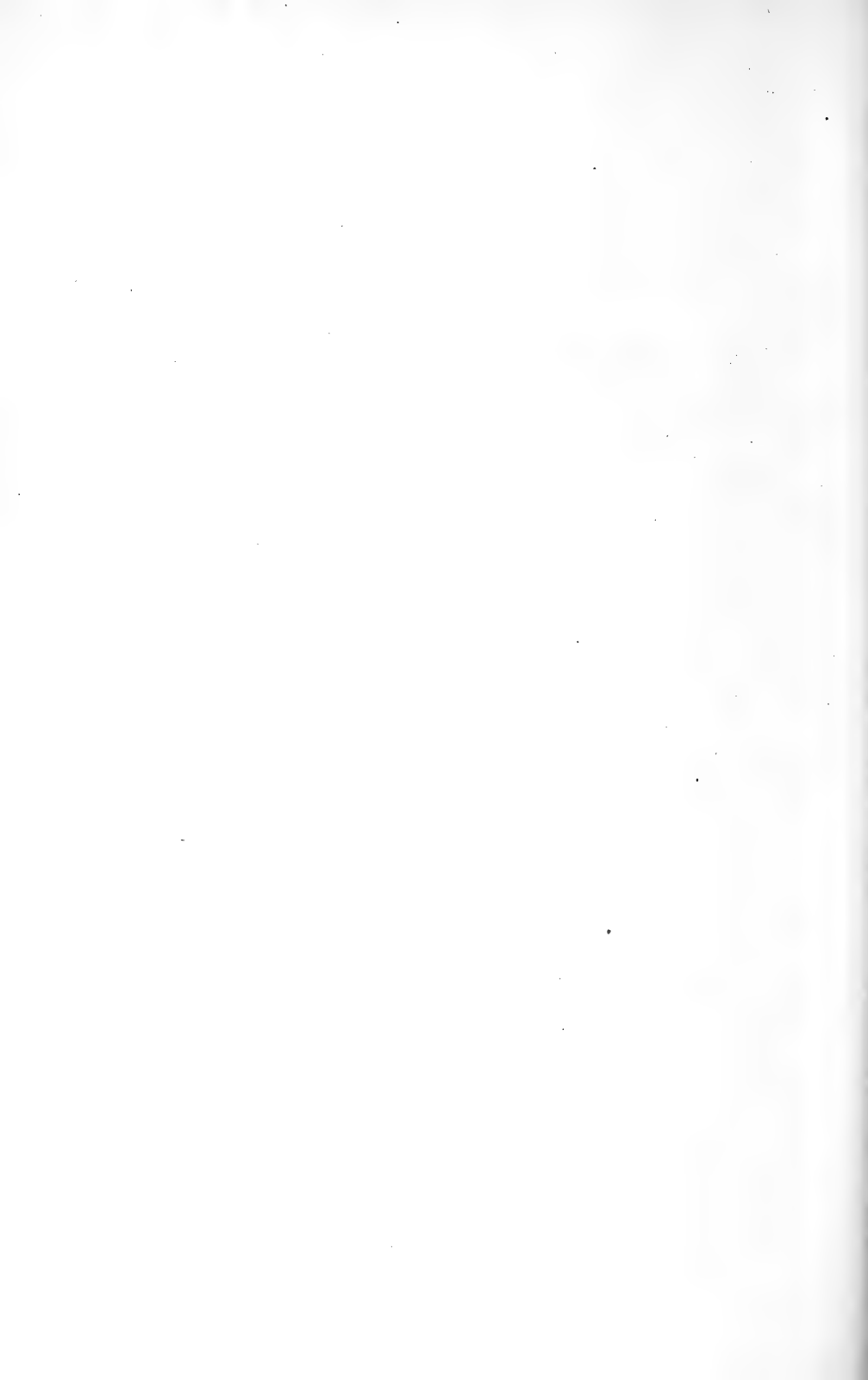
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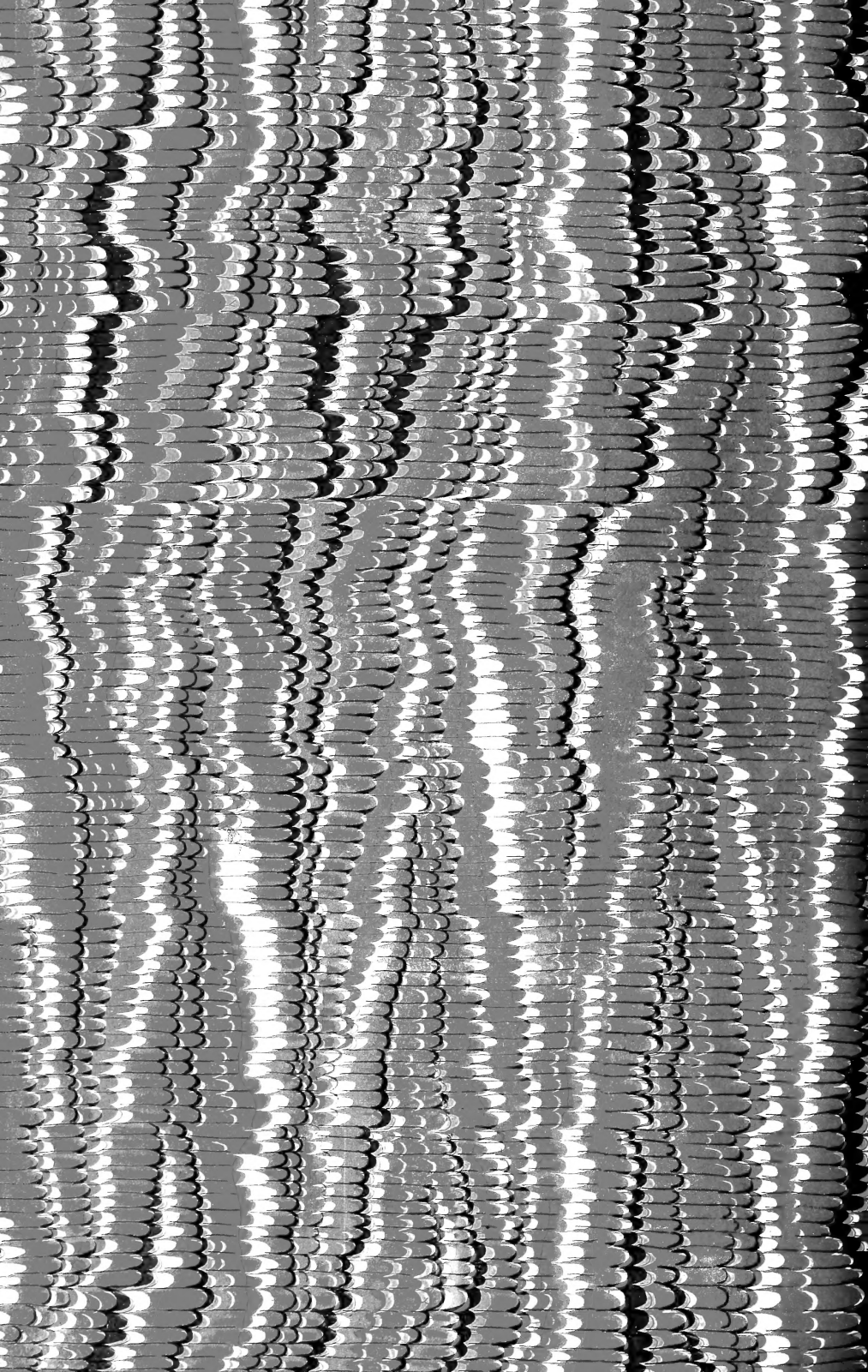
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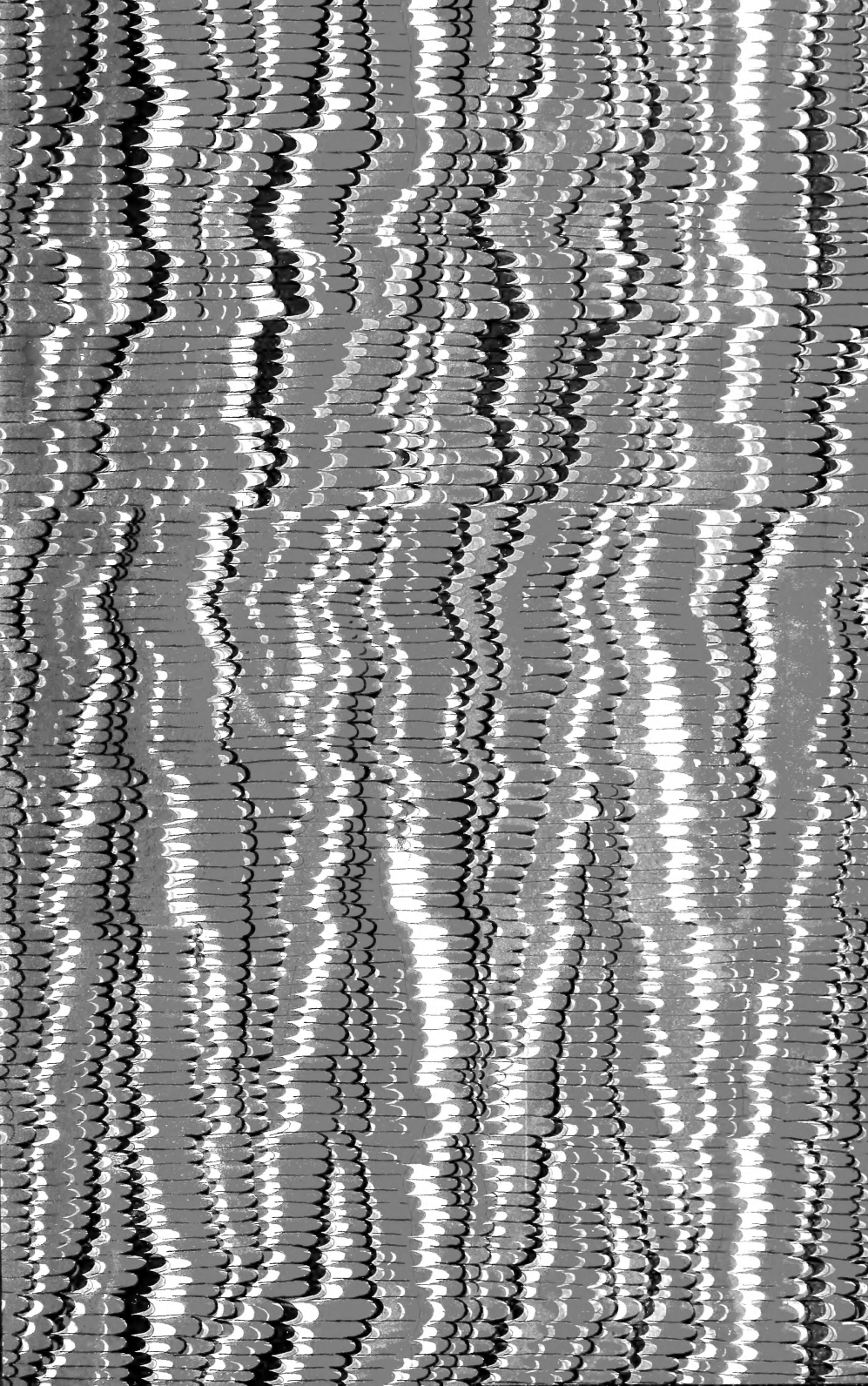
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